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THE MINERAL-WATERS OF KREUZNACH

BY

EDWARD STAREL, M. D.

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THE MINERAL WATERS

of

KREUZNACH

described for physicians

by

EDWARD STABEL, M. D.

Member of the Physico-medical Society at Bonn, of the German-medical Society at Paris and of the Medical Society at Strasbourg.

With ten illustrations.

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KREUZNACH

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Preface.

Since the scepticism and nihilism of our days have shaken blind trust in authority, practical medical science has been forced to lay higher claims to therapeutic experiences than in former times and consequently the course which Balneology had to take up was defined. If it would not proceed in the old beaten track, exact observations and scientific proofs must take the place of bare empiricism.

In the last decennaries chymistry and physiology have made gigantic progress and their attainments are submitted to medical science everywhere, as the only rational base.

Balneology must also be treated from this point of view, if it is to fill worthily its position among the different branches of medical science. In this way only will it be possible, if it be required to determine

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the sphere of a spring's action — by constant attention to the human body, daily more and more explored by the aid of the microscope and chemical reagents — to ascertain exactly the properties of its component parts and to find out by their action the total effect of the water and what diseases it is qualified to cure. — Impressed with the fact, we often only divine, where we think we know the truth already, I have well considered the importance and the difficulties of this task, having in view the demands which science now makes on Balneology, and I beg not to be judged too severely, if I have not succeeded in fulfilling them satisfactorily.

Referring to the Pharmacodynamics of the single components of our spring I have adopted in general the same opinions, which Clarus has laid down in his pharmacology.

I should have added a chapter on the contra-indications to that on the indications, if in the enumeration and discussion of the different diseases, in which our waters act with success, the respective indications for the use of the brine had not been well denoted and if the Etiology and Symptomatology as well as

the development and the course of the diseases or the differential diagnosis had not found the minutest consideration.

I have intentionally omitted a closer description of divers cases of diseases which we treated here at Kreuznach, because such minutiae, though they may be very interesting, often remain unnoticed by the reader. I have only represented one case and I think I am the more justified in giving publicity to it specially, because when explained by illustrations it shows more plainly than the history of any other illness, be it ever so voluminously described, the healing power of our Naiad.

If I discuss at greater length some subjects, which belong, properly speaking, more to the sphere of Surgery than of Balneology, be pleaced to pardon my fondness for Surgery which is natural to me, as I was in former times Assistant Surgeon to the University College Hospital at Bonn.

Kreuznach, May 1868.

The author.

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Chapter I.

Kreuznach and its Environs.

A few miles above the junction of the Nahe and the beautiful Rhine, the former divides into two arms, forming an island. That division was not formed by nature, but by the art of our ancestors, who required that second arm, as a canal to give water to their mills. They planted the soil of that island with shrubs, to give it solidity and protect it against the violence of the high water. There having grown gradually to mighty trees changed the island to that delightfull park which now performs the centre of our watering-place.

It was in our days, that those blessed springs were found, quite close to that place, where the coloured sandstone formation ends and the porphyry begins. The „Elisenquelle“ (Eliza's well) rises on the utmost south-west point of the island. It is a place of pil-

grimage for patients from all parts of the world, from all zones, it is a place, where all nations meet. Patients go early to the spring, drink from time to time, walk in the shrubbery, talking cordially with their friends, enlivened by the music of our excellent band.

The time of bathing approaching, it grows more quiet and still in the park; but a few persons walk up and down or take a seat, either reading or resting.

After dinner all the bathers meet again. Toilet is refined and the assembly takes the character of a cheerful society assembled to a happy feast; refreshments are supplied on the terrace of the „Kurhaus" and our eyes dwell with pleasure upon the meadow's lovely green, where gay children are bustling in their merry play. Again the orchestra resounds and drives away all sad humours; its last sounds having died away and night having laid its dark shadows softly over the country, a spectacle of a peculiar kind frequently begins on fine summer's evenings. The river begins to beam with life, numerous boats meet by torchlight, rockets rise high in the air, bengal lights, in the most splendid colours, change from time to time night into day. — Or the park, illuminated with thousands of lamps, hung on the trees even to their tops, is changed into a fairy palace, resounding with the mirth of the crowd, passing up and down.

They separate only at a late hour, to meet again on the following day, either at the Eliza's spring or to make an excursion in the neighbourhood according to agreement.

Like a peninsula in a large lake, the „Kauzenberg" stands in the broad valley, where Kreuznach is situated, surrounded by mountains, covered with vines. Its summit is crowned with a lion of stone on a high pedestal, visible at a great distance, which Johann von Sponheim erected to the eternal memory of the valiant rescuer of his life.

Having passed the large „Nahe-bridge" of Kreuznach, uniting the two parts of the town, we are guided by a small path, through a narrow lane and an orchard of blooming fruit-trees to the plateau of the mount, if we do not prefer the easier ascent by the main-entrance to „Baron von Recum's" property. — Here the Panorama of Kreuznach presents itself to the astonished eyes.

In the midst of a fertile and rich country, in the midst of green fields, the town lies at our feet, partly winding in a semi-circle about the Kauzenberg, or extending upon the bank of the river, reflected in its waters, partly confined to the plain in the south-east by softly rising hills.

Everywhere picturesque clusters of trees.

The new part of the town has a fine aspect with

its improvements, avenues and pretty houses, which lying in the open air resemble villas more or less and are prefered as residences by the patients during their stay. — The frame of the picture is formed by a circle of fragrant gardens, in which grow the finest fruits, otherwise cultivated only in the mildest parts of South Germany. — Beautiful high roads open the traffic in all directions; the German railways facilitate the communication and Kreuznach is therefore drawn near to the remotest countries.

In the streets of the town reigns an active and lively bustle, announcing that business in general is flourishing. Here the lordly carriage hurries by the busy crowd of people, there comes a heavily laden waggon, bringing wares or transporting to other countries the productions of the soil or of the industry. — Our fiery wines are sent to all parts of the globe. — Kreuznach is well known for its tanneries and tobacco-manufactories and renowned for its sculpture.

But this picture does not show the present alone, it conjures up the past likewise to our mind.

Kreuznach is rich in historical associations.

The now ruined walls of the fortification and towers of former times, and the venerable remains of the „Kauzenburg" call to mind the romantic period of the middle ages.

Just opposite us rises in pure Gothic style the

only edifice which has come down to us from that time, the choir of the former Cathedral, dating from 1332.*)

There in the plain our eyes descry even a reminiscence of the remotest ages, the ruins of a Roman castle; pickaxe and ploughshare frequently bring to light even at the present day, coins, urns and inscriptions.

Leaving our present point of view and taking the road along the back of the „Kauzenberg“ we come upon another scene. We look into the valley, where the salt-works of „Karls- and Theodorshalle“ lie. — A world of mountains seems to surround us. — As the graceful landscape smiled before with its waving cornfields and immeasurable vine-trellises which bound the horizon and vanish amid the distant mountains of the „Taunus and Hunnsrück“, so romantic is the aspect which the country now affords with its steep precipices, picturesque walls of rock and densely wooded summits.

Just before us rises a high ridge, the „Hardt“, gradually melting into the „Salinenwald“ and bounding the horizon in an undulating line. — We climb the first eminence of the „Hardt“ and are soon in the midst of the forest. — It is the „Gans“ which — opposite to us — rises majestically on a broad base. — The

*) In 1857 this choir was restored and arranged for an English church, since which time there is English Church Service during the whole season.

valley becomes narrower and in the back ground, like a closing gate, advance enormous porphyritic rocks, bearing on their summits the ruins of the castle of the „Rhein- and Wildgrafen".

The bright colouring of the luxuriant meadow-grounds below the valley forms a lovely contrast with the dark green of the woods, and whilst calm silence surrounds us, interrupted at times but by the cries of the wood-pigeons, by the cuckoo's note, or by the roe-deer, scared away by our steps, there below reigns life and activity. — Small gondolas float on the clear mirror of the Nahe, numerous ramblers are seen going along the river, elegant carriages roll up and down. The machinery of the salt refining-works, put in motion by large water-wheels, move creakingly, and the smoke ascends in whirls from the salt-house's chimneys and dances in the sunshine, announcing the industrious management of the salt-works.

We climb the summit of the mountain and pursue the path up to the dizzy height of the „Rothenfels", where the highest reward awaits us. — Towering porphyritic masses with vertical, rifted and splintered walls, deep precipices and high pyramidal peaks rise like giants in a great circle before us, or, when we turn our eyes to the country, we see the Bavarian palatinate, resembling a garden, sparkling with yellow, waving cornfields, covered with towns, villages and

hamlets. — Just before us stands the „Ebernburg" on a pointed cone, formerly the favorite seat of „Franz von Sickingen". Yonder the large ruins of the „Altenbaumburg" become visible; opposite to them rises the „Lemberg" hiding with its outstretched back the ruins of „Montfort and Moschellandsberg". — Our eyes wander farther and farther over valleys and rounded mountain-tops, till they reach the „Soonwald" in the west and to the south-east the gigantic „Donnersberg" like a grey mist in the distance.

To the left we see the charming „Münster a/St.". That which we admired in the „Salinenthal", which put us in ecstasy there, finds here its highest perfection. — In a great half-moon the „Nahe" flowes round its meadow grounds. The summits which surround the pastoral village in an almost regular circle are higher, the outlines of the mountains more beautiful.

But the day declines; the sun gilds the „Rheingrafenstein" with its last beams. We hasten by the snakelike windings of the new path down the valley. The train comes bustling up and conveys us back to Kreuznach in a few minutes.

Each day brings new pleasures. — In the „Kursaal" balls and literary evening-entertainments, musical productions and great concerts alternate one with the other, and without, wherever we turn our steps, the imposing nature of the environs of Kreuznach with

its numerous ruins of castles, its magnificent views over a country richly covered with villages und hamlets, affords the highest enjoyment.

No wonder that once the genial painter und poet Müller of Kreuznach, far away from his birthplace and remembering all its grandeur, broke forth in the enraptured words: „Yes, thou art the beautiful, excellent country, which drives away sorrow and grief, and brings joy to the heart. Life flows on more smoothly and the years glide by more gently; the clouds beam and pass smilingly, when the playful wind bears them to thy mountains. There are the poplars, the alders, the willows by the verdure covered banks of the most lovely of rivers, in whose shade I first lay in all the ardour of youth, where I first opened my heart to the tumultuous consciousness of almighty Nature."

Chapter II.

Climate of Kreuznach.

Since the choice of a watering-place does not depend on the spring and its ingredients alone, but its climatic conditions being also of the highest importance, some observations on the climate of Kreuznach may find a suitable place here.

The climate of the middle rhenish plain, in the north-west part of which Kreuznach (North lat. 49°50′12″, East long. from Ferro 25°31′20″) is situated, is warm, clear and dry. Dr. Dellmann, head-master of the College of this place, came to this conclusion after laborious and careful observations, made during 12 years in the service of the Royal Prussian Meteorological Institution and recorded it in his work: „Das Klima der mittel-rheinischen Ebene und die Spannung der offenen Säule".

The comparison of his ascertained facts with those of other stations yielded the above final result of the climate's character of the plain of the Middle-Rhine. It might almost be assumed, a priori, of a country, so distinguished in zoological, botanical, mineralogical and geological relations, that its climate must have peculiar advantages. — The result of Dr. Dellmann's tabulated observations confirms that supposition for the middle rhenisch plain to a certainty. From these tables we learn the particular data of the height of temperature, of the atmospheric pressure, the clouds, the direction and force of the wind, the expansion of vapor, the relative humidity, the forms of the clouds, the electric phenomena and the quantity of rain of Kreuznach.

They contain further the proof that very happy climatic circumstances prevail in our neighbourhood and that Kreuznach particularly in comparison with other cities of the middle rhenisch plain can show the most favorable figures.

As a deeper look into that interesting and attractive work, to which we refer, will be desired by the professional meteorologist, we extract from it the data in so far as they have a special bearing on our subject.

The temperature being one of the most important factors which lead to favorable meteorological relations shall have the first consideration.

1.) *Monthly Maxima (1) and Minima (2) of Temperature.* *(Degrees according to Fahrenheit)*

Years		Jan.	Febr.	March	April	May	June	July	August	Septbr.	October	Novb.	Decbr.	Means
1851	1	49,3	50,4	58,7	70,0	68,9	82,6	82,3	82,7	66,4	68,0	49,3	51,6	64,1
	2	20,7	20,5	14,0	30,7	35,5	47,7	50.4	49,3	36,0	32,2	26,6	18,5	31,9
1852	1	56,9	53,1	66,8	65,5	86,0	78,6	92,7	83,1	75,1	66,6	61,9	57.1	70,3
	2	15,1	22,6	17,6	23,0	33,3	47,3	52,6	51,3	37,6	28.1	31.1	27,9	32.3
1853	1	50,2	42,3	55,4	68,0	77,2	84,1	92,1	90.7	75,4	65,7	59,2	39.6	66,7
	2	27,5	14,0	17,6	29,9	36,9	51,3	54,0	48,6	42,8	32,4	23,6	— 2,5	31,3
1854	1	47,7	50,7	61,2	69,3	75,6	81,7	89,8	82,8	81,7	72,0	52.6	52,2	68,2
	2	14,9	14,0	23,4	27,7	42,8	44,5	52,9	50,2	36,0	32,2	20,0	27,1	32,1
1855	1	48,8	45,2	55,8	69,6	78,8	90,5	83.7	84,6	73.8	72,5	49,7	43,6	66,4
	2	— 4,2	— 7,8	16,7	30,4	37,4	48,6	53,8	50,2	36,0	33,6	20,5	1,4	26,4
1856	1	53,5	61,4	62,3	73,4	80,1	82,6	83,7	90,5	72,2	69,3	52,2	58,3	70,0
	2	11,0	20,5	20,3	22,3	37,8	47,9	45,9	49,5	45,5	26,6	20,7	9,1	29,8
1857	1	45,7	46,8	58,5	73,4	84,1	86,9	90,5	97,6	78,8	70,6	57,6	49,5	70,0
	2	17,6	13,6	20,0	35,3	34,6	43,6	53,1	53,5	41,2	37,8	22,3	26,2	33,2
1858	1	43,4	45,5	66.1	75,6	82,4	95,4	87.3	89,5	82,4	66,8	48,6	51,6	69,6
	2	7,2	12,7	25,2	27.5	36,0	52,0	51,3	46,8	47,3	24,8	2,7	17,4	29,2
1859	1	51,8	53,5	64,2	72,7	78,6	87,8	93,4	94,5	79,0	77,4	63,0	56,7	72,7
	2	13,1	24,1	24,3	29,5	45,0	51,3	56,9	53,5	41,0	25,9	20,0	2,7	32,3
1860	1	55,4	45,0	59,0	66,1	81,9	81,2	86,7	80,5	75,1	64,2	55,2	48,1	66,5
	2	23.0	9,1	21,7	33,3	39,8	48,1	47,7	51,8	39,4	31,3	24,3	13,1	31,9
1861	1	47,3	55,6	62,5	65,3	81,9	92,5	84,1	93,7	83,8	75,6	52,9	54,0	70,8
	2	— 9,2	28,6	30,4	32,0	36,2	54,9	55,6	52,6	45,0	27,1	20,3	14,9	32,2
1862	1	54,9	54,5	67,0	80,1	81,9	87,6	90,5	82,6	78,8	72.0	57,4	49,7	71,4
	2	8,6	11,7	22,6	32,0	46,8	50,9	50,4	52,6	44,5	32,0	14,4	18,5	33,1
Means	1	50,4	50,7	61,5	70,0	79·8	86,0	88,2	87,7	76,8	70,1	55,0	51,1	69,0
	2	12,1	15,1	21,1	29,4	38,6	49,3	52,1	50,9	41,1	30,3	20,6	14,4	31,2

2). Mean temperature of the three Times of the day for the following years. (Degrees according to Fahrenheit)

YEARS.	TEMPERATURE.			MEANS.
	A	B	C	
1851	44,24	53,78	46,71	48,24
1852	45,63	57,09	48,27	50,34
1853	42,80	53,51	45,39	47,23
1854	44,22	55,56	47,23	49,00
1855	42,87	53.08	45,00	46,98
1856	44,91	55,38	47,55	49,26
1857	45,68	57,67	48,31	50,56
1858	43,27	55,48	46,31	48,36
1859	47,23	58,48	49,82	51,84
1860	44,42	53,38	46,04	48,02
1861	45,57	56.19	47,52	49,75
1862	46,65	58,03	48,92	51,19
MEANS:	44,78	55,65	47,25	49,23

In the course of the day we distinguish three periods, morning, afternoon and night. As observations are made three times a day: at 6 o'clock in the morning, 2 o'clock in the afternoon and 10 o'clock at night, we intend under „Morning" the time from the first to the second observation, under „Afternoon" the time from the second to the third observation and under „Night" the time from the third observation to the first of the following day. — Heading the columns with A for the first, with B for the second und with C for the third daily observations, we shall obtain the variation which has occured in the morning, when we compare A with B, that of the afternoon, when we compare B with C, and that of the night by comparing A with C. — M is the mean temperature of A, B, C.

Now if we ask: what is the mean temperature by the thermometer at Kreuznach in the forenoon, that is from 6 o'clock in the morning till 2 o'clock p. m. at which hour the mean temperature is found to be highest, we find, that if the sum of the 6 o'clock observations during the twelve years be divided by the number of observations we get the figures 44,78; that if the two o'clock observations be dealt with in the same manner we obtain the figures 55,65 and so the average forenoon rise of the thermometer is 55,65—44,78=10,87 degrees. In the afternoon on the contrary, it sinks as much as 8,4 degrees and further in the night 2,47 degrees.

It is certainly of great interest to see that it sinks much more in the afternoon than at night, since the sun shines in the afternoon and does not during the night. — The cooling as much as the warming should, circumstances being the same, be at least proportional to the time and here the decrease of the warmth does not follow the rule. — Therefore there must exist a circumstance which exerts an influence on the temperature in quite a different way during the afternoon from that in the night.

At first we must refer to the law of nature, that bodies cool the faster, the warmer they are, and then to the fact, that the sky is generally clouded during the night and that therefore the cooling proceeds more

slowly. — The clearer the sky, the more the earth receives warmth in a given time, but it also cools the faster. — That is precisely the reason why with a clear sky such a s u d d e n cooling takes place in the tropics, that animals, when sleeping in the open air, are frozen to death and men fall ill in spite of all precautions.

The second table shows also that the mean temperature of the 12 years 1851 to 1862 at Kreuznach is 49,23. Two of these twelve years: 1853 and 1855 remain under 48, four years: 1852, 1857, 1859 and 1862 rise above 50, the remaining have a temperature between 48 and 50 degrees. The coldest year is 1855 with 46,98, the warmest 1859 with 51,84, the next warmest 1862 with 51,19 degrees.

3) *Mean Monthly Temperature.*

YEARS	Jan.	Febr.	March	April	May	June	July	August	Septb.	Octb.	Novb.	Decbr.	Means.
1851	35,49	35,31	41,72	49,93	51,10	62,49	62,85	64,71	54,23	51,35	35,76	34,02	48,24
1852	37,98	38,34	37,40	44,22	57,06	60,64	68,97	64,87	57,36	46,83	47,37	42,91	50,34
1853	40,10	30,81	33,03	45,68	54,99	62,40	65,82	64,47	57,60	49,05	38,68	24,03	47,23
1854	31,00	33,64	42,60	48,81	57,06	61,32	66,15	62,37	57,78	50,34	37,87	39,09	49,01
1855	27,07	27,15	39,20	47,23	53,60	62,89	63,93	65,52	58,21	53,73	37,92	27,43	46,98
1856	35,04	40,77	38,55	49,91	53,69	63,41	61,95	67,32	58,39	49,86	35,08	37,17	49,26
1857	33,48	32,61	40,41	47,44	57,83	64,35	68,74	70,18	61,16	53,24	40,30	36,95	50,56
1858	29,19	29'89	38,75	49,23	54,68	70,32	64,87	64,62	62,94	49,64	29,80	36,75	48,36
1859	26,00	40,05	46,51	50,25	59,34	65,14	73,06	69,75	59,56	52,77	38,73	30,97	51,85
1860	37,60	30,92	38,16	47,39	59,49	61,23	62,51	63,05	57,54	49,37	35,62	33,38	48,02
1861	23,18	39,65	43,86	46,35	55,83	66,45	66,54	68,63	59,43	51,85	41,65	33,73	49,75
1862	32,25	: 6,48	45,61	53,60	61,50	61,48	65,61	64,69	61,27	52,79	41,38	37,78	50,83
Means.	33,30	34,59	40,48	48,31	56,35	63,52	65,91	65,84	58,80	50,90	38,37	33,96	49,20

From the third table we see that the warmth during the three months, from the beginning of June to the end of August is nearly the same. July with 65,91 ist the warmest month, August follows with 65,84. Examining these twelve years one by one we perceive that always one of the three months of June, July or August has the monthly maximum of the year. In 1858 it fell in June with 70,32; in July 1852 with 68,97, 1853 with 65,82, 1854 with 66,15, 1859 with 73,06, 1862 with 65,61 and in August 1851 with 64,71, 1855 with 65,52, 1856 with 67,32, 1857 with 70,18, 1860 with 63,05 and 1861 with 68,63, the greatest number also in August. — The highest monthly mean temperature of all these twelve years was in July 1859. Considering the rising and the falling of the temperature we see a great rise beginning from March and afterwards a rapid falling from October, so that the three warmest months are preceeded and succeeded by two months, which have likewise a tolerably high temperature.

In order to show the advantage of the temperature of the middle rhenisch plain, compared with other countries of Germany, we must observe that the continental climate prevails here decidedly more than in the west and northern parts of Germany, and its elevation above the sea being about 300 feet, the warmth rises especially in summer to a height which is only

surpassed by some places in the most southern parts of Germany.

The clearness of the sky and the small quantity of rain contribute a great deal to that rising of temperature. Both phenomena are explained by the scanty forests. In the course of the last centuries forests were obliged to give way to vineyards particularly on the summits.

The continental character of the middle rhenish plain is proved by ten yearly mean temperatures of the month of August from 1848 to 1857 of four cities and the mean temperature of the two principal seasons of the same interval of three cities, viz:

4. a) *Mean temperature of August from 1848 to 1857 of*

Cleve,	Boppard,	Trier and	Kreuznach.
62,67	63,29	64,26	64,82

b) *mean temperature of summer and winter.*

	Boppard,	Trier,	Kreuznach,
winter	35,10	34,88	34,27
summer	62,93	63,70	64,13

If we consider the „Rheingau", in many respects the most renowned part of the middle rhenish plain, with Kreuznach at one end and Frankfurt at the other and take as average the mean of these two cities, we find that in hot summers its warmth exceeds that of Boppard by $2^{0},92$ and that of Trier by $2^{0},25$. The higher temperature of the „Rheingau" in summer is again

proportionally higher in the day-time than at night, its climate approaching that of the tropics and the mean difference between the Rheingau and Boppard in the warmer months of the years of 1857 to 1859 amount to 3,84 degrees. But such a difference exerts a great influence on vegetation, as is proved by the fact that 2,25 degrees more for spring and summer suffice to turn an ordinary year into a good wine-year.

The daily as also the yearly range of the Barometer follows that of temperature. — We omit the vast tables referring to the atmospheric pressure as taking us too far away from our subject.

Besides the range of the atmospheric pressure, resulting from that of the temperature, there are other phenomena which act with and react upon the latter, though they have their origin in it. — The appearence of the sky and the wind are considered here. (The general direction of the wind at Kreuznach in the 12 last years is S. 53°19′ W.) — Its influence on the temperature of the middle rhenish plain is proved in that work by facts.

Having shown that the two first qualities of the climate of the middle rhenish plain, Warmth and Clearness of sky, are established by the deductions given above, we pass on to the explanation of the third peculiarity, that is of its Dryness: It will be found in comparing the amount of the rain-fall.

The rain is caught at all stations belonging to the Royal Prussian system of meteorological observations by a funnel, whose mouth has an area of one French square foot. — A short tube unites it with a hollow cylinder from which the collected rain-water is drawn off in a glass cylinder graduated in French lines. A second funnel is put on during snow-fall and the snow collected in the first is then liquefied.

5). *Monthly number of rain-days.*

YEARS	Jan.	Febr.	March	April	May	June	July	August	Septb.	Octb.	Novb.	Decb.	SUM
1851	6	11	19	17	14	8	16	12	9	11	15	9	147
1852	18	13	3	2	15	17	8	15	9	9	17	7	133
1853	15	15	9	18	12	10	12	10	9	17	8	9	144
1854	16	14	4	7	22	19	17	16	4	10	14	18	161
1855	10	10	16	9	12	12	21	7	2	10	7	14	130
1856	18	7	7	15	26	15	13	9	15	3	13	14	155
1857	14	4	11	13	16	7	6	7	15	8	9	7	117
1858	7	6	7	9	13	3	10	12	8	6	10	11	102
1859	7	11	8	11	9	10	4	7	11	13	12	11	114
1860	17	14	15	10	5	15	6	14	11	10	10	20	147
1861	3	6	18	5	9	12	12	3	7	5	17	9	106
1862	13	8	10	10	13	14	12	7	6	10	4	13	120
Means:	12,0	9,9	10,6	10,5	13,08	11,8	11,4	9,9	8,8	9,3	11,3	11,8	131,3

We see that good wine-years show fewer rain-days. — The month of May has the greatest, September the least number, which is of importance for the vine.

6). *Number of Thunder-clouds.*

Only clouds from which thunder is heard and rain falls are reckoned as thunder-clouds; electrical phenomena and rain-fall must be united.

YEARS	Jan.	Febr.	March.	Apr.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	SUM.
1851	0	0	1	1	1	3	6	3	0	0	0	0	15
1852	0	1	1	0	8	6	10	8	2	1	2	0	39
1853	0	0	0	0	4	0	9	4	0	1	0	0	18
1854	0	0	0	1	6	8	1	6	0	0	0	0	22
1855	0	0	0	0	0	4	11	8	0	1	0	0	24
1856	1	0	0	1	4	7	12	4	3	0	0	0	32
1857	0	0	0	0	8	4	3	6	10	1	0	0	32
1858	0	0	0	1	2	4	2	4	2	0	0	0	15
1859	0	0	0	0	8	6	2	3	0	0	0	0	19
1860	0	0	0	0	3	2	1	3	0	0	0	0	9
1861	0	0	1	1	2	4	4	2	0	0	0	0	14
1862	0	0	0	2	5	4	5	3	1	1	0	0	21
Means.	0,08	0,08	0,25	0,58	4,25	4,33	5,50	4,50	1,50	0,42	0,17	0,00	21,7

7.) *Height of rain for 144 months.*

YEARS	Jan.	Feb.	March	Apr.	Mai	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	SUM.
1851	2,78	4,54	27,91	24,94	29,12	15,72	34,58	31,27	19,27	8,25	12,93	3,15	214,46
1852	20,92	20,45	11,64	2,70	32,73	29,14	14,12	44,61	20,68	21,15	39,21	14,14	271,79
1853	30,43	13,29	4,76	28,44	35.86	33,68	19,89	13.34	14,33	17,68	4,85	6,84	223,39
1854	26,38	11,09	1,32	9,12	36,73	37,77	26,73	37,82	2,91	27,59	23,87	22,96	264,29
1855	7,89	12,71	19,27	10,58	13,62	42,35	48,56	11,36	2,64	19,72	9,68	17,42	215,80
1856	15,59	3,63	4,74	32.13	40,89	39,46	22,97	18,25	41,22	5,23	23,20	10,48	257,79
1857	6,00	2,37	3,74	7,21	22,38	6,71	3,68	8,31	36.25	9,52	11,94	3,90	122,01
1858	6,40	3,67	3,19	6.36	17,36	3,65	35,29	21,99	7,07	7,60	29,96	9,24	151,76
1859	8,69	10,98	5,12	14,05	54,28	25,95	6,40	9,32	16,75	15,68	24,31	16.53	208,16
1860	21,20	14,25	19,22	7,45	14,07	15,38	14,01	24,86	20,03	18,40	12,80	32,93	214,90
1861	11,77	3,17	25,06	2,52	11,28	33,48	27,44	4,27	22,38	10,05	30,18	9,98	191,58
1862	22,61	8,57	9,07	9.77	39,29	35,16	47,52	7,85	12,43	13,89	2,14	20,77	229,07

The average monthly height of rain at Kreuznach during twelve years is shown in the above table in French lines:

15,06	9,06	11,25	12,96	28,97	26,54	25,10	19,44	18.00	14,56	18,76	14,05

SUM: 213,80.

Comparing the ten years amount of rain at Kreuznach with that of seven other cities, the Royal Prussian meteorological Institution gives the following proportions:

8) *Monthly amount of rain.*
(In French lines, seasons in inches.)

	Cleves	Crefeld.	Cologne.	Boppard.	Kreuznach	Trier.	Frankf a/M.	Mannheim
January .	29,81	22,19	17,62	18,36	15,75	26,16	10,92	8,11
February .	29,17	25,57	16,92	18,00	9,68	15,53	5,48	7,08
March . .	19,46	14,33	14,00	17,38	10,48	13,85	7,55	7,16
April . .	25,10	26,38	25,41	29,35	15,76	31,35	14,94	16,83
May . .	31,12	25,63	30,48	36,30	26,68	34,41	27,63	40,63
June . .	30,55	26,47	26,49	31,00	28,69	34,50	27,68	37,74
July . .	33,49	26,84	26,21	29,46	24,36	34,40	23,21	34,03
August .	25,85	33,21	29,47	33,29	23,55	34,41	22,94	23,55
September	22,01	21,18	19,02	21,32	19,61	19,35	12,08	18,68
October .	32,45	28,36	23,89	23,54	12,73	26,59	15,00	10,99
November	25,35	23,37	18,36	22,43	15,10	19,99	11,11	26,83
December.	29,85	27,06	18,88	18,90	11,22	17,98	14,25	5,63
winter .	6,569	6,235	4,452	4,605	3,054	4,973	2,554	1,735
spring .	6,307	5,778	7,491	6,919	4,410	6,626	4,177	5,385
summer .	7,491	7,210	7,098	7,812	6,383	8,609	6,153	7,943
autumn .	6,651	6,075	5,149	5,608	3,953	5,494	3,182	4,708
Year . .	27,018	25,299	24,190	24,934	17,800	25,702	16,066	19,771

The rain-clouds coming to the middle rhenish plain must pass the „Hunnsrücken," whereby they cool and let fall a portion of their water. — Passing then over the plain of the Middle Rhine, which has particularly in summer a higher temperature, their inclination to condense diminishes, since the greater warmth of the soil produces a warm ascending current of air, which exerts its influence on the clouds by dissolving them.

And in fact, there are very often phenomena in summer — and particularly in warm summers — during thunder-storms which confirm this opinion. — In the last six years we have often seen a heavy thunder-storm approach from the SW. with its storm, its thunder, its flash of lightning but without any rain or only a very little. — The rustling of rain-drops in the leaves of trees sounded like music when, after a long dryness, it happened at last to rain. The difference in the amount of rain between Kreuznach and Trier may be followed up into detail; for the heaviest rain-shower of the last twelve years brought in Trier from 3 to 5 o'clock p. m. during the month of July 217 cubic inches to the square foot, in Kreuznach only 168.

Exactly in accordance with the opinion developed above, the dryness of the climate of the middle rhenish plain proves to be of a higher degree

in warm summers. — So the mean rain-fall in the three summers 1857 to 1859 was at Kreuznach 53%, at Boppard 63%, at Trier 65½% of the mean amount of rain.

These facts may suffice to prove the truth of the following statement: „The climate of the middle rhenish plain is warm, clear and dry." — Having thus detailed the individual character of the climate of the middle rhenish plain, in which Kreuznach participates with particular privileges, we will mention some traits due to its locality.

The direction and situation of Kreuznach with regard to the points of the compass deserves to be noticed. Leaning on the North-West against a great ridge of hills, the outer spurs of the „Hunnsrücken," which shelter from heavy North- and North-West winds, the valley is wide open to the South-East. — The day scarcely dawns before the warming beams of the sun greet our city. The width of the valley allows a permanent action of the sun and an open entry to the currents of air; a stagnation of the air is thereby prevented and its purification materially promoted. The rising vapours evaporating continually out of the river, which runs through our valley, likewise aid the ventilation. At a late hour the sun leaves us, disappearing behind the western hills, and a long time after sunset the surrounding mountains reflect the

warmth and hinder sudden oscillations of the temperature.

Owing to these happy combinations as here described, Kreuznach perfectly satisfies all the conditions required for a place where patients may find health and be roused to a new life.

To this happy climate we owe the privilege of never having been visited by endemical and very rarely by epidemical diseases.

Chapter III.

The Mineral Waters of Kreuznach.

A. Their physical condition and chemical combination.

The springs of Kreuznach belong to the saline kind and properly to those which on account of their abundance of Chloride of sodium (Chlornatrium) are suitable for precipitation. — They contain moreover Jodine and Bromine.

Our mineral water taken fresh from the spring is clear and colourless. Its taste is a little harsh and saline, its smell like vapors of Jodine. The water pearls when poured into a glass since it contains carbonic acid. — After standing for some time the carbonic acid sets on the inner side of the glass in the form of small beads and escapes after a short time. — Now the colour changes; the ochre (oxyd of iron, peroxyd of manganese, carbonate of potash, silica and

clay) separates and gives to the water a yellowish lustre, as long as it is suspended. But after some hours the liquid clarifies and the ochre sinks to the bottom of the glass.

Kreuznach has three springs:

1) The Eliza's-spring — only used for drinking.

2) The Nahe-spring, conducted by means of tubes from the river bed to the north-western banks of the island and thence to the „Kurhaus," running directly into the bathing tubs.

3) The Oranien-spring, near the beautiful establishment „Oranienhof", serving exclusively for baths.

The chemical composition is shown by the analysis of the respective springs.

In 16 ounces = 7680 grains are contained:

	Eliza's spring		Nahe-spring	Oranien-spring
	according to Löwig (1838)	according to Bauer (1840)		according to Liebig
	grains	grains		grains
Chloride of sodium .	72,883	72,922		108,705
„ „ calcium .	13,389	13,276		22,749
„ „ potash .	0,624	0,971		0,460
„ „ magnesia	4,071	0,251		—
„ „ lithium .	0,613	0,075		traces
Jodide of sodium . .	—	0,003		—
„ „ magnesia .	0,035	—		0,012
Bromide of sodium .	—	0,307		—
„ „ magnesia .	0,278	—		1,780
amount of solid matters	91,893	87,805		133,706

	Eliza's spring		Nahe-spring	Oranien-spring
	according to Löwig (1838)	according to Bauer (1840)		according to Liebig
	grains	grains		grains
Latus	91,893	87.805		133,706
Carbonate of Calcium .	1,693	—		0,255
„ „ magnesia	—	1,351		0,130
„ „ strontian	—	0,683		—
„ „ baryta .	0,017	0,299		—
„ „ peroxyd of iron .	—	0,199		0,356
„ „ peroxyd of manganese	—	0,009		—
Magnesia	0,106	—		—
Oxyd of iron . . .	0,154	—		—
Peroxyd of manganese	0,006	—		—
Silica	0,129	0,313		0,999
Clay	—	0,021		
Phosphate of clay .	0,025	—		0,09
amount of solid matters	94,023	90,680		135,541
Warmth	55°Frht.	55°Frht.	50°Frt.	55°Fhrt
Specific gravity . .	1,0095	1,0095	1,0095	1,02
Contents per cent. .	1,22	1,22	1,22	1,75

Some other springs have in recent times been made by boring; but as they have neither been analysed nor made use of by patients, we shall leave them for a future communication.

Two of the ten springs which now form the salt-works of Kreuznach within a distance of a quarter of a mile, the principal one at Karlshalle and that of Theodorshalle, are only used for drinking; the others, as also the two above named, serve for the production of common salt and for baths.

In 16 ounces = 7680 grains are contained:

	Principal Spring at Karlshalle according to Osann. (1836)
	grains.
Chloride of sodium	59,665
„ „ calcium	2,561
„ „ potash	0,407
„ „ magnesia	0,678
„ „ lithium	0,056
„ „ aluminum	0,432
„ „ manganese	0,653
Jodide of sodium	0,044
Bromide of calcium	6,602
„ „ magnesia	1,367
Carbonate of calcium	0,613
„ „ magnesia	0,473
„ „ peroxyd of iron	0,364
Silica	0,031
Organic matters	1,471
amount of solid matters	75,417.
warmth	76° Fahrenheit
specific gravity	1,0117
contents per cent	1,5

	Principal Spring at Theodorshalle according to Mettenheimer.
	grains
Chloride of sodium	70,602
„ „ calcium	11,758
„ „ magnesia	4,124
Carbonate of peroxyd of iron	1,436
„ „ calcium	
Muriate of potash	
Clay	
Phosphoric acid	
Silica	
Lithium	
Jodine	
amount of solid matters	87,920
Warmth	70° Fahrenheit
Specific gravity	1,0107
Contents per cent	1,25

In 16 ounces = 7680 grains are contained:

	Principal Spring at Theodorshalle according to Düring.
	grains.
Chloride of sodium	57,191
„ „ calcium	14,707
„ „ potash	0,297
„ „ magnesia	4,416
„ „ lithium	0,039
Jodide of sodium	0,031
Carbonate of calcium	2,149
„ „ magnesia	0,199
„ „ peroxyd of iron . . .	0,218
Silica	0,099
amount of solid matters	79,346
warmth	73° Fahrenheit
specific gravity	1,0107
contents per cent	1,25

At the time where the principal spring of Theodorshalle was analyzed (1825) bromine was not yet discovered.

At Münster a/St., situated about 25 minutes further west, there are six springs of which the principal one is only used for drinking, the remainder being worked for common salt and used for baths. A well-

constructed apparatus in the Trinkhalle evaporates the brine.

In 16 ounces = 7680 Grains are contained:

	Prinzipal Spring at Münster a/St. according to	
	Löwig.	Mohr (1853)
	grains.	grains.
Chloride of sodium	61,726	60,998
„ „ calcium	11,623	11,083
„ „ potash	0,012	1,342
„ „ magnesia	0,946	1,471
„ „ aluminum	0,018	—
Jodide of sodium	—	0,0004
„ „ magnesia	0,012	—
Bromide of sodium	—	0,663
„ „ magnesia	0,248	—
Carbonate of calcium	1,555	1,123
„ „ magnesia	0,296	—
„ „ peroxyd of iron	0,226	0,034
„ „ „ of manganese	0,010	—
„ „ lithium	traces	—
Silica	0,031	0,007
Clay	0,013	—
Phosphoric acid	traces	—
amount of solid matters	76,716	76,7214
warmth	87° Fahrenheit	87° Fahrenheit
specific gravity	1,007	1,007
contents per cent	1%	1%

A glance at the analyses shows that the spring at Kreuznach and the salt-works of Karls- and Theo-

dorshalle and Münster a/St. all correspond in quality and that there are only differences in quantity and temperature. We shall soon see how much that difference in temperature influences the drinking-cure, though it is of no consequence with regard to the baths, as all our springs must be warmed to make them fit for bathing.

The amount of carbonic acid contained in the different springs has not been everywhere ascertained. At Münster a/St. Mohr found in the brine of the main spring by 32° Fahrenheit and normal atmospheric pressure 20,9 volumes per cent of that gas. Setting aside that it escapes by warming the water, this quantity would be too inconsiderable to exert any influence on its bathing properties, whilst for drinking it suffices to give an agreeable taste and a slight prickling on the tongue.

The total want of sulphate of lime in our mineral water is of great importance. A too intense action on the intestinal canal is thereby prevented.

B. The method of cure in employing the waters of Kreuznach.

1). Drinking-Cure.

Whilst our mineral waters contain so large a quantity of common salt that they are fit to be worked for its production, yet they do not contain too much chloride of sodium and can therefore be used for therapeutic purposes.

Our graduated brine*) would be as little fit for internal use as the acrid mineral waters of other baths,

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*) We understand under graduated brine that liquid which has been obtained by concentrating the simple brine, by allowing it to trickle seven times through the thorn-twig walls from 25 to 30 feet in height in the graduation-buildings. The evaporation which hereby takes place reduces the quantity of water and increases the percentage of common salt from 1 — 1¾ to 12 — 20%. It is only then, that the brine is fit for boiling.

Sixteen ounces of brine graduated to 14% at Münster a/St. contain according to Mohr:

	grains
Chloride of sodium	927,6365
„ „ calcium	155,4586
„ „ magnesia	12,0192
„ „ potash	19,0771
Bromide of sodium	9,7766
Jodide of sodium	0,0056
Clay	0,2304
Oxyd of iron.	traces.

Amount of solid matters: 1124,2040 grains.
Specific gravity with 59° Fahrenheit 1,1118.

which are so called on account of the too large quantity of common salt which they contain. However an excess of the prescribed quantity of our water would also occasion a great stimulation of the mucous membrane of the intestinal canal. That is the reason why it is almost impossible to give a fixed prescription of how much is to be drunk and that it must be left to the medical adviser to adapt the quantity to the age and particular malady. — With children we begin usually with two ounces daily and raise it to 10—15 ounces in the course of the cure. We give to adult persons 4 ounces in the beginning, but do not exceed the dose of 20—30 ounces daily, as that would hinder the digestion of the water and cause a rising and even vomition by the too great dilution of the gastric juice. — This portion may not however be taken by the patients at one time, but at short intervals in a space from one to two hours, they moving meanwhile in the open air either in the „Kurgarten" or in the gardens of their hotels. — To that end they have a pitcher fetched every morning from the spring. — If the patient is advised to walk during the cure, it is not meant that he dares not take a seat now and then on the benches or chairs scattered everywhere as resting-places. The cheering sounds of the band will certainly often invite him to listen with leisure to its melodies.

The water is commonly drunk in the morning from 6 to 8 o'clock, though very often small portions are also taken in the afternoon from 5 to 7 o'clock; but the dose must then be divided in such a manner that in the afternoon only half the quantity of that in the morning is to be taken.

Even patients to whom drinking in the afternoon is prescribed are not required to follow that order pedantically, as an excursion in our romantic neighbourhood is to be preferred. He who will be conscientious may take his drink in a little bottle with him or draw it out of the spring, if his way leads him in the „Salinenthal."

The water ought to be drunk in the morning before having eaten any thing, the organism being then in the most fit state to assimilate the water. — Feeble individuals, particularly delicate children, who having risen in the morning cannot endure a long fast with an expenditure of strength, may take their dose an hour after breakfast. In cases of bad weather it must be drunk in the room or in large covered places, be it in the drawing-rooms of the different hotels, in the „Kursaal" or under the sheltering roof of the colonnade. Very sensitive patients, particularly children, may take the water in bed in the morning;— only we would then diminish the dose.

The water is to be drunk as it comes from the

spring except in the case of dyspeptical illness, pain in the stomach and tendency to vomit. — We allow then the addition of milk, whey*) or another mineral water, according to the individual case. — Circumstances even may require that the latter must be substituated for our water.

A cold, refreshing draught out of the Eliza's well (56° F.) during the hot sommer months will be very agreeable, whilst an addition of warm milk or some hot water will suit for fresher days in spring and autumn. At Münster a/St., where the spring has a temperature of 87° F., it is necessary to expose the water some time to the open air to cool it. That is particularly to be observed with patients who are disposed to congestions to the head and heart or with whom the water of the warm spring induces a tendency to vomit. On the contrary we give the preference to the spring at Münster a/St. or a warm addition to the Eliza's spring in case of chronical catarrhs

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*) The whey-establishment set up here some years ago may be mentioned as an excellent supplement to our balneological sanatory remedies. A man from Appenzell comes to Kreuznach every spring with a great many mountain goats and manages the preparation of whey.

Whey is a half transparent, light green liquid with a sweet taste and an aromatic odour.

Whey is milk without caseïn and butter; among its solid component parts the most prominent is milk-sugar; contains besides different salifiable bases of milk.

of the respiratory organs and to delicate and feeble individuals who require an increase of their internal warmth.

2.) Bathing-Cure.

a) Full-bath.

The patients having finished the drinking-cure mostly take a short rest about 8 o'clock in the morning and then go to bathe. — The temperature of the bath varies between 88° to 95° F., because baths, which seem to be too warm for young and powerful persons, are agreeable to old and feeble ones. — This individual feeling depends also upon outer relations of temperature, upon weather, upon a higher or less degree of sensibility of the cutaneous system and upon the momentary frame of mind.

Notwithstanding it would be better to take a warmer bath, as water cools during its use, though that circumstance might be compensated by opening the warm stop-cock, and not to run in the contrary extreme, that is to take it too cold, subduing the slight shivering by which patients will then be attacked. — The last proceeding has also its disadvantage, as catching cold is very possible and the best may be to take the temperature so that its first impression seems to be a little too warm. The colder water stratum will be brought in contact with the

body by soft rubbing and light movements and so compensate the apparently too high degree of warmth.

Respecting the time, the physician has to adapt it to the individual case and to prescribe for how long the bath is to be taken. We begin with children with 10, with adults with 15 minutes and rise with the latter to 45 minutes, very rarely to one hour, in the course of the cure. With children, however, we scarcely ever go beyond 25 minutes.

The first and second bath is usually taken in pure mineral water without any addition of mother-lye (Mutterlauge)*). Both are proof-baths in order to

*) Mother-lye is the residuum when the graduated brine is boiled down and the common salt crystalized. It is a clear yellowish-brown oily liquid. When evaporated and deprived of the greatest part of its water we get the mother-lye-salt.

In former days mother-lye was poured away as worthless; in our days it serves to strengthen the baths and to produce Bromine and Lithium:

Loersch gives a list of different analyses of mother-lye of Kreuznach up to the present time.

Mother-lye of Kreuznach in 10000.	1 Bunsen.	2 Mohr. 1854	3 Polstorf. 1852	4 Rieckher 1846	5 Rieckher 1846	6 Fehling.
Jodide of magnesia	0,7	traces	traces	25,1	79,3	—
Bromide of „	53,2	76,7	68,8	98,2	286,1[4]	61,5
Chloride of potash	214,7	170,4	219,2	143,2	471,8	238,3
„ „ sodium	34,4	208,0	348,4	497,2	356,5	63,8
„ „ magnesia	296,8	334,8	265,1	262,9	403,9	344,4
„ „ calcium	3323,9	2622,6	2330,7	2232,4	3880,1	2570,3
„ „ lithium	145,3[1]	—	10,3[2]	[3]	[5]	[6]
Sulphate of calcium**	—	—	—	2,2	2,8	—
Solid matters:	4098,0	3412,5	3225,0	3272,0	5493,0	3293,0
Specific gravity:	—	1335,5 with 72°,2F.	1313,3	1307,4 with 74°,1F.	—	1317,6 with 74°,1F.

see how brine reacts on the body. From the third day we strengthen the baths with mother-lye, beginning with a quart (= 2 pints) and rising to 15 to 20 quarts, when suitable to the patient. If shivering, palpitation, congestions to the head, dizziness and glimmering before the eyes appear, the quantity must be diminished, with very sensitive patients and with children to the half, even to one third.

Instead of mother-lye the graduated brine can likewise be used to concentrate the bath, as it contains solid matters, iron excepted, in greater proportion in consequence of its evaporation in the graduation-works. The graduated brine contains also that chloride of sodium, which is wanting in mother-lye, as it crystalizes on the production of common salt.

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1) Mother-lye of Theodorshalle. 2). Inspissated mother-lye. 3). Deliquescent mother-lye salt.

1). As also chloride of strontium 28,6. Traces of Caesium and Rubidium.

2) As also iron, manganese, traces of phosphoric acid.

3) Chloride of Aluminum 10,3.

4). Perhaps a rich bed of Bromine was analysed.

5) Chloride of Aluminum 12,5.

6). Chloride of iron 0,9.

„All these analyses are proportioned. For the specific gravity is water taken as = 1000 for a standard and not as usually pure water = 1 "

**) The sulphate of calcium, which Rieckher proves, seems to be a mistake, as all the other analyses deny the existence of any sulphate.

We usually fix the time of the cure to 4 to 6 weeks, if menstruation, a strong catarrh or some other unexpected accident does not oblige us to interrupt it. — An imperative stop happens then; the organism seems to be saturated; digestion is injured, sleep troubled, stool stops or excretions are excessive, eruptions on the skin (bath pustules or bath pimples) form, a certain torpidity and uneasiness come over the patient and the patient gets feverish. — In those cases we are obliged to stop the cure, if we will avoid risks of a serious kind, and leave the full action of the drinking-cure and the baths to the beneficial after-effect (Nachkur).

It is not to be said that these symptoms must happen or that they exert any influence on the further course of the malady. In many cases where the cure was successful they have not been observed and we have also seen that bath-pustules, especially, appeared as often in the beginning of the cure after a small number of baths, as at its end. Those symptoms therefore seem to be accidental appearances provoked by individual sensibility of the intestinal canal and of the system of the skin.

Patients who leave our bath and are not quite satisfied with its effect may trust to their recovery, which certainly will take place hereafter. — They are not only under the power of the medical properties of

our waters, by which the organism is saturated, during the cure but also after it. We can, therefore, decidedly expect that they will act and display their full effect, even when patients have left us a long time, a phenomenon which will be explained, if we think that there are patients, visiting Kreuznach, who have rooted maladies, which they have endured many years or which they have got before their birth.

If one season does not suffice to cause a perfect cure, we order it to be repeated the next summer, or we let the patient begin another course of baths simultaneously with internal use of the waters in their abodes after a suspension of some weeks. In cases of that urgency we insist that both courses of cure be employed here on the spot, because the cure at a distance from Kreuznach can never have that adventage which the bathing-place itself affords, if the patients are given to domestic business and deprived of the inspection of the leading physician. — If time or economical circumstances do not allow the patient to stay longer or to return to Kreuznach the following year, he may also with advantage drink and bathe at his home. The considerable transmissions of the Eliza's spring and of mother-lye, which take place every year, are evident proofs of this. Everywhere the patient will find a garden and beautiful walking-places to move in the open air, and versed in the methodical internal and

external use of the brine and dietetical prescriptions and assisted by the advise of the physician, he will likewise solve the task of his cure.

With respect to the season, the summer is preferable for the use of a cure; yet patients, whose maladies do not allow a delay, may employ the cure even during the winter months. They will find a friendly reception in our numerous hotels, provided with almost every comfort and elegancy.

Only urgent reasons can induce us to prescribe a second bath in the afternoon.

b) Arm- foot- and sitting-baths.

Along with the full-bath there are frequently used arm- foot- and sitting-baths, usually prescribed for the evening hours.

c) Local use of the Waters of Kreuznach.

Besides the above mentioned cases our spring is likewise used for local purposes.

a. For Compresses.

We take the water warm, when it is required to mollify and liquefy, or cold (as a hydropathic wrapping, wholly or partly enveloping neck, breast or an extremity, or as Neptune-girdle, applied to the abdomen), when a reaction in the concerned parts of the body,

a revulsion of the blood-stream to the exterior must be induced in order to exert a deriving impression on deeper lying parts and to favour the resorption of solid and liquid exsudations.

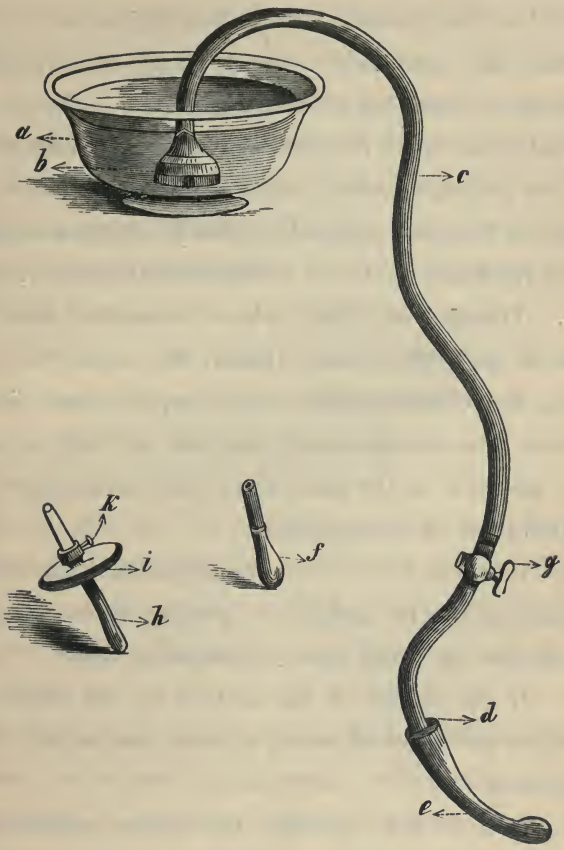
When we see that this method is crowned with great success by using common water, how much must it be with our spring carrying so powerful agents within it. We can boldly make an addition of mother-lye for individuals with insensitive skin, which would call forth undesirable pustules (Eczems) in the case of delicate and very sensitive persons.

β. For Injections.

With respect to injections into the vagina, the rectum and the nose, I recommend to my patients always the apparatus described in v. Scanzoni's excellent work: „Compendium of deseases of the female sexual organs," which I have had made for me here at Kreuznach for a number of years and which has suited in all cases. — My apparatus is modified in some respects, having united the excellencies of the two apparatus there described. (See fig. 1.)

This apparatus consists of a small leaden bowl (b) with an aperture in its upper part in which an elastic tube (c) five feet long with an additional piece made of horn (d) is fixed. This bowl, the border of which has some small incisions, is to be dipped in a

Fig. 1, Injection-apparatus.



a) Vessel filled with the injection-liquid.
b) Leaden bowl.
c) Elastic tube.
d) Additional piece of horn.
e) Curved mother-tube.
f) Mouth-piece for sucking.
g) Stop-cock.
h) Straight wooden mother-tube.
i) Round movable disk.
k) Adjusting screw.

vessel (a) standing on a table and filled with the liquid to be injected. The patient sitting on a chair before the table puts a short mouth-piece (f) upon the above mentioned additional piece and sucks till the liquid begins to flow out of the elastic tube, in consequence of the syphon's power, whereupon the short mouth-piece is to be removed and supplied by a curved mother-tube (e) which is to be introduced into the vagina.

Though every body who is acquainted with the law of the syphon knows that at the moment of sucking the efflux-aperture of the syphon must stand deeper than its other end, we will not fail to turn the attention of the patients to this circumstance in making use of the apparatus.

It will not need to be remarked that the power of the jet can be modified by placing the vessel higher or deeper, by using wider or narrower tubes.

If the height of the table does not suffice to produce the required effect a chair put on the table will do it.

If it is not agreeable to set the apparatus at work by sucking, you may close the stop-cock (g), fill the elastic tube with brine and sink the leaden hemisphere into the vessel containing the injection-liquid.

This apparatus is distinguished above all others by its cheapness and suitableness. — It represents the simplest douche ascendante.

This apparatus unites all excellencies of similar instruments (Clysopomps and Irrigateurs) without their deficiencies. The patient can make use of it at every time without any help. The apparatus, set agoing, works with the ease and security of a machine, moving in uniform measure. The liquid, according to the vessel chosen, requires no filling up; the jet flows not by jerks but permanently and can be increased or diminished at each moment by the stop-cock.

Latterly I have used a straight wooden mother-tube (h) with a round disk (i) moveable by an adjusting screw (k) instead of the curved mother-tube. This apparatus has the great advantage that the mother-tube can only be brought into the vagina as far as the disk, which is of importance in the case of sinkings of the uterus; an injury of an ulcerous vaginal portion of the womb can, therefore, be prevented by it.

We use cold or warm brine with or without an addition of mother-lye according to the end which we pursue.

If the vagina does not bear injections we reduce them to washings. For that purpose we use a bath-speculum, which the patient puts into the vagina during her stay in the bath. In this manner the brine can penetrate to the Laquear vaginae. At the same time the pierced sides of the instrument allow to the brine a lateral contact with the vagina.

Provided with a suitable additional piece the above described apparatus can be also used in the application of a clyster.

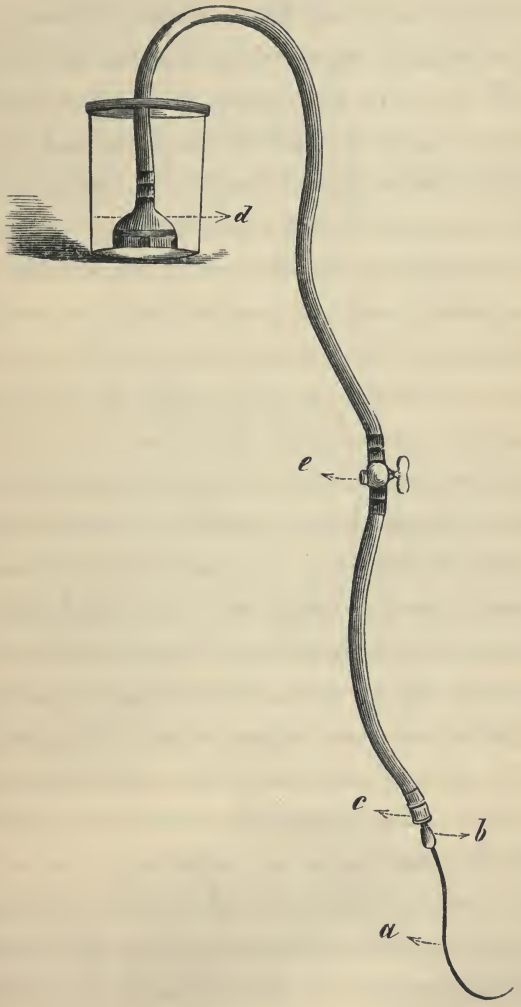
It may be further mentioned that this apparatus is to be recommended for injections into the bladder.

To this end I have caused a small cylinder (b) to be fixed to the aperture of an elastic catheter (a), which fits close to the additional piece made of horn at the lower end of the elastic tube. As it is a matter of importance that no atmospheric air gets into the bladder, the additional piece (c) is to be closed with the finger and pushed quickly into the cylinder after having applied the catheter and set the apparatus in action. In order to see how much has been injected, the injection-liquid is to be poured into a transparent glass. If it is sunk as far as the line (d), the stop-cock (e) is then to be closed in order to prevent the penetration of air into the bladder and the catheter is then to be removed. If a Solutio argenti nitrici is chosen to be injected, the leaden bowl is to be changed for a small stone or a glass bowl, to obviate the influence of such a liquid on the metal.

Finally it may be mentioned, that this apparatus is fitted for an eye-douche and that it can be used as nose-douche, which Weber of Halle recommends in his local therapeutics of the nasal mucous membrane. If the additional piece of horn (fig. 2. c) is brought

into one of the nostrils, the injection-liquid goes up into the nose and runs back by the other nostril,

Fig. 2.



without flowing into the throat. In that manner a large portion of liquid, even a pail-full, can be conducted in a perpetual jet. Weber recommends the nose-douche particularly in the cases of Ozaena and some conjunctival affections, for maladies of the Tuba Eustachii and even the frontal cavity; for syphilitic formes he prescribes a sublimate-solution and for sufferings of other nature he prefers among sundry injection-liquids that of a rarefied solution of common salt. In respect to the effect which we have observed after injections with our brine we can but assent to that choice.

γ. For Douche-baths.

We apply the brine partly to revive nervous activity in paralysed limbs, partly to bring about the dissolution of tumours or exsudations by incitation to resorption. As the action of the douche depends on an irritation, an increased blood-supply and a temporal hyperaemy, and as that effect can also be obtained by applying coldness without regard to the power of the jet, we only make use of the cold douche, when the dignity of the part (head, abdomen and genitals) forbids the application of a powerful jet. It is self-evident that the constituents of the brine in douching are of a subordinate importance. The application of the douche requires in all respects the greatest pre-

caution. We prescribe it in the beginning once or twice a week and that for a short time and in general neither increase the frequency nor the power of the jet, nor the duration to such a degree that painful and inflammatory irritations are to be feared.

3) Appendix.

Prescriptions in employing the Waters of Kreuznach and dietetical regimen.

Patients, particularly children and delicate individuals, coming from a long distance, are not required to begin with the cure immediately after their arrival, but may be permitted to rest themselves for some days, partly to recover breath after the long and troublesome voyage, partly to become used to the new climatical relations and in many respects to the different mode of life.

In bathing take precaution not to wet your head. The brine clings very fast to the hair and absorbs damp very eagerly out of the air in consequence of its containing chloride of calcium (a hygroscopical substance) particulary when mother-lye has been added. In spite of the most careful drying, hair will always get wet anew and therefore be the cause of catching cold. It is also desirable to hinder the brine, particularly when mother-lye has been largely used, from entering into the ear-canal, in order to prevent in-

flammations of the delicate membranes which line it. The washing of the head or repeated plunges are only to be advised in the case of those pustules which have taken place especially on the hairy-places of the head; but careful and often repeated drying must then be prescribed. If you do not fear the little trouble to wash your hair out with common water after the bath, it will dry sooner, as chloride of calcium is diluted and removed by so doing.

When getting out of the bath you may directly wrap yourself up in a large bath-sheet, which has been got ready, and carefully dry yourself with the aid of a second person especially the hairy parts of the body and between the toes, where humidity adheres the most. The bath-sheet must be of a coarse and rough material in order to produce a reaction on the skin, which is made sensible by the warm bath of every change of temperature, and to guard against catching cold. In order to obtain that effect in a higher degree, I do not allow the bath-sheet to be warmed, though many patients desire it.

Having finished the bath the patient goes into his apartment and takes his breakfast, if he has not yet broken his fast, which will usually be the case, as we allow only to children and persons of a sensitive constitution to breakfast before the bath. This breakfast consists mostly of milk or cacao and white bread. Weak

coffee or tea is allowed only exceptionally to patients who cannot well do without it. The time till dinner is to be occupied with reading, visiting or receiving friends or short and not tiresome walks. Those who are affected by the bath will do well to take a short nap.

Dinner must not be too abundant but also not too scant, as the appetite of the patients is increased by our spring, since early rising with late breakfast, the bath and the excursions require an outlay of strength which must be re-supplied in proportion.

We recommend therefore a good soup, a substantial piece of meat with vegetables [asparagus, green pease, young beans, cauliflower, sprouts, spinach, carrots, scorzonera, potatoes (only purée)] and some roast meat or fowls with sweet stewed fruits.

Fat, sour, too salt, smoked or pickled meats are to be avoided, as they do not agree with our waters.

A glass of wine or some light beer is a welcome addition to the meal, though it must be forbidden to many patients. The physician has to individualize here. It is better to be too cautious, than too free. When health, the noblest gift of men, is the question, one may certainly deny one's self luxuries for some weeks.

The afternoon is usually devoted to a more extended tour to some beautiful point of the delightful environs of Kreuznach. But these excursions may not be made too long, that the patient do not return too

tired and exhausted and that he may find time to digest his supper before going to bed, a point which cannot be valued too highly.

To this end supper may consist of light food: some cups of milk, a little soup, some white meat with stewed fruits or some soft boiled eggs will suit well.

It is easily understood, that these prescriptions are only given in general, that they are not fit for every individual. Often circumstances compel us to deviate from the prescribed rule and to substitute a poorer and milder diet.

The same dietetical regimen, which has been observed during the cure, must be kept up after it for at least four weeks, because patients after arriving at their home are still under the power of the brine. A violation of this important rule will be punished on the spot. I have observed vomition and violent diarrhea not only in cases of foolish dietetical mistakes made some weeks after the termination of the cure, but also by too prompt a return to the former mode of life. Independently of these inconveniencies the desired effect of the cure will partly be neutralized.

C. The effect of the Mineral Waters of Kreuznach.

Having arrived at the explanation of the effect of the brine, we are unable to give everywhere the desired particulars. — That brine acts, we know. Thousands who leave Kreuznach annually with grate-

ful hearts bear eloquent witness of it, but on the how of the action we do not possess positive and unfailing proofs in every respect. The reason of our ignorance is to be sought in the deficiency of science and in that the animal economy is not yet sufficently explored. „Into the heart of nature a created being cannot penetrate."

However it would be a false conclusion to declare that, where a satisfactory explanation is wanting, there is no effect. It is the same with the explanation of the action of many medicaments, which we daily prescribe in practice. I mention here for instance calomel. The well known phenomena after the use of it are the grass-green, pappy stools. About the changes the calomel undergoes in the stomach and how the stools finally work out, we find whole pages of the most ingenious explanations in our compendiums. It would lead us too far to enter into these particulars and finally we should arrive at the conviction that there were but bold hypotheses of our authors without reaching the bottom, without enlightening this darkness.

I go farther. I mention the main-stay of the Materia medica, the absolutely necessary and indispensable Opium. Whe have immediately recourse to it, when it is required to stop violent vomition and purging, though we do not strictly know in what way Opium restricts vomition or acts as Anti-

diarrhoicum. If it but paralyzed the movements of the intestines and diminished the number of stools without modifying simultaneously the secretion of the mucous membranes, its utility would be quite illusory. But it seems indeed as if Opium, besides its influences on the movements of the intestines, perhaps modifies just in consequence of this influence, the secretions of the intestinal mucous membrane (Niemeyer).

Returning to the explanation of the effect of the brine, we have to answer two leading-questions:

1.) How brine acts when used internally?

2.) How brine acts when used externally?

If we consider firstly the action of the constituent parts in detail, the combined effect will appear for itself.

As brine consists of water and solid matters, the question that will at first occupy us is: How water acts.?

The mission of the water which we drink daily at dinner and in the course of the day, or which we take in other liquids, is to lixiviate the meals, we have taken in order to dissolve the constituents of the food that are useful and requisite for our support and alimentation, and to favour its resorption. The water of the brine is the bearer, the Menstruum, of its solid matters and delivers them in a dissolved condition to the stomach, so bringing them into the juices of the body and turning them to account for medicinal purposes.

Conveyed to the vascular system the water does not only thin the blood, but furthers also the transelementation, causing a larger secretion through the kidneys and carrying therefore more solid matters out of the blood. „The water clears the organism of the refuse; the throwing out of the latter is simultaneously the condition of forwarding formation or restoration. We do not know any substance which favors formation so quickly after having prepared the retrograde formation.“ (Boecker).

Further may be mentioned the favorable influence which water in itself exerts on the defecation. Water facilitates stools, as it moistens the solid excrements and stimulates in consequence of its coldness the peristaltical movements. The mineral-water cure will cause this in a much higher degree, as according to prescription the brine must be drunk in the morning before one has eaten any thing.

Among the constituent parts of the brine, Chloride of sodium especially excites our attention. Predominating quantitatively over the other ingredients, chloride of sodium is to be considered as principal factor in respect to the effect of the brine. Besides the chloride of calcium there are but few constituents in any quantity in the brine. Though we do not expect a great effect from these minimal doses, we must not at all despise these medicaments, but greet their pre-

sence in the brine as a welcome adjunct to the chloride of sodium.

As the use of chloride of sodium excites appetite and enlivens the digestion, we must expect an increased excretion of the gastric juice produced by the irritation which chloride of sodium exerts on the mucous membranes of the stomach.

That this irritation of the chloride of sodium on the membranes does not confine itself to the stomach, but acts further on the intestinal canal, stirring up the secretions and increasing the peristaltical movements, we learn by the fact that thin stools come after taking large quantities of chloride of sodium.

On account of the favorable effect which chloride of sodium exerts on the disturbed digestion in chronical inflammation of the stomach and the intestinal canal, we must further attribute to it a muci-dissolvent property.

But even after the resorption into the intestinal canal, after having been introduced into the juices, chloride of sodium has not at all lost its stimulative property, on the contrary it exerts still that irritation though taken up in the chyle and blood and arrived at the remotest parts of the body. How could we otherwise explain its action on the bronchial tube, the increased secretion of the mucous membranes of the respiratory organs, which we see take place after the

use of the brine in chronical inflammations of the lungs? How could we explain the intumescence, painfulness, even inflammation of scrofulous swellings of the glands, when using the brine? In these maladies we justly ground the sanative power of the brine on the permanently irritating property of the chloride of sodium. — As chloride of sodium promotes the disturbed respiration in the lungs, caused by the accumulation of decomposed mucous masses, disssolving the mucus by exciting expectoration and therefore discharging the hyperæmical vasculars of the Bronchia, so we see pathological tumors of the gland-system diminish and dissapear, as chloride of sodium, through its irritating property restores the stopped circulation of the capillaries and dissolves the pathological exsudations', causing its liquefaction and resorption.

We can only explain the action of the brine by that irritation of the chloride of sodium which it causes, when, in using our waters, we see chronical cutaneous eruptions disappear. A higher irritation causes a higher congestion and exsudation of the skin and therefore a prompter termination of the process of the disease.

The water of the brine comes to the blood by absorption out of the intestinal canal. By means of the kidneys, of the respiratory and perspirative organs the water taken up is removed. Anew resorption follows a new secretion, so that a continuous absorption

in the intestinal canal and a new saturation of all contextures of the organism takes place. But water alone does not go this way of resorption and excretion; chloride of sodium taken up in the circulation wanders in its company through the remotest channels of the body in order to participate in the transelementation. Chloride of sodium is not only a constant component part of the blood, but also a predominant one among the mineral components of the Serum sanguinis, which gives in normal condition about 61% of its ashes. If therefore chloride of sodium is absolutely necessary for the existence of the organism its high importance for the metamorphosis of the matters of the body, which we attribute to its presence in the brine, is also proved. —

Besides that constancy of the chloride of sodium in the blood, its condition of mixture with the Albumen has influence on the transelementation, since Albumen and Chloride of sodium stand in an inverse ration to one another in the serum (Vogel and C. Schmidt).

Moreover, chloride of sodium seems to keep Albumen in the blood liquid and by that fluidity to favor the metamorphosis in the contextures. At least in the artificiel gastric juice the solution of coagulated Albumen is promoted by the addition of chloride of sodium. (C. G. Lehmann.)

The surplus of common salt is eliminated with the urine, perspiration, mucus and saliva, whence is explained the taste of salt in the mouth and the increased saliva-secretion which we often observe in our patients consequent on the influence of the brine. The augmentation of urea in the urine is likewise to be attributed to the larger secretion of chloride of sodium (Liebig).

That part which common salt plays by its influence on the transelementation in the inner economy and its infinite processes forms the principal and final act in the long line of its operations. Out of the improvement of the transelementation results the improvement of the blood as also of the alimentation and vice versa. A normal condition of the different organs of the body takes place, till the cure is accomplished.

Next to the chloride of sodium in respect to the quantity which is found in the brine comes Chloride of calcium. We are not perfectly acquainted with its effect on the organism. On account of its capability of being easily decomposed, free muriatic acid of the gastric juice may be rather formed from it than from chloride of sodium; further an increased secretion of urine has been observed after its use. Moreover it may assist chloride of sodium in its effect on the matamorphosis of the matters like other salts of lime.

Lithium is to be found in the brine as Chloride of lithium and Carbonate of Lithium. According

to Garrod lithium is the best dissolvent for uric acid. As lithium may be solubly combined with uric acid (urate of lithium) it serves in case of uric diathesis partly for its extinction partly to bring already formed uric concrements in the bladder, kidneys, gall-bladder and uric accumulations in the synovial membranes and joints to resorption.

In consequence of the irritation which Jodine exerts on the membranes of the stomach, it causes a larger secretion of gastric juice. It participates therefore with the chloride of sodium in that line of effects which can be produced by these irritating properties.

As chemistry gives us no farther certain data respecting the direct effects of Jodine, its use is entirely empirical. We are therefore obliged to draw our conclusions on its effect from experience. It is a fact that solid exsudates, hypertrophies and indurations, even goiter and other tumors disappear after the use of Jodine. We therefore cannot deny that it has liquefying and resorbent effects. We may also presume by its quick transition into blood, its just so quick secretion in urine, saliva, perspiration and milk and the increased secretions itself, that we owe its considerable sanative power to its promotion of the most important secretions of the organism.

Respecting the action of Bromine we want likewise positive evidence. However the general opi-

nion is, that its therapeutical character has a great resemblance to that of Jodine.

Carbonate of Calcium. Besides phosphate of lime we find carbonate of lime quite constantly in the skeletons of the vertebral animals; according to the experiments of Valentin it is even predominent in newly organized bones over phosphate of lime. It is therefore to be supposed, that phosphates of lime are formed from free phosphoric acid and carbonate of lime existing both in the body, as in the latter years that proportion turns out in the reverse. Its necessity in the formation of the skeleton is therefore as evident as the influence of the carbonate of lime in the brine on organic metamorphosis of the matters, since all contextures contain carbonate of lime.

On the above we ground its sanative power in maladies which may be traced to a want of lime (Rhachitis) or to a disturbed alimentation of the contextures (Scrophulosis).

The action of Iron depends upon its value with respect to the sanguification and indeed it does not go to the formation of blood-corpuscles alone, but it also promotes the origination of new blood-cells. It is here that the sentence: „Iron makes blood" finds its explanation. If these facts should not be proved by scientific studies, the daily experience of the successful

effect of iron, when given to feeble, poor blooded, particularly chlorotic patients would convince us. We dare say that the favorable influence of our waters in improving the blood, in nourishing and developing the different contextures may depend on the iron which is contained in the brine.

A similar sphere of activity may be likewise claimed for Manganese.

Though these components of our brine may be so small, yet they approach in weight to many springs, which have the reputation of being strengthening iron-waters.

The remaining components of the brine are of inferior therapeutical value.

We arrive now after the explanation of the internal effect of the brine to the discussion:

How brine acts in external use?

If there are anywhere controversies, it is in this respect. But there are two ways in which brine can exert its influence: Either brine is absorbed by the skin and comes then to account, or its action is a contact-action, that is, it acts on the organism according to its physical impression upon the skin, or finally, both actions exist simultaneously.

The first opinion, that brine in bathing is absorbed by the skin and then conducted into the juices, is at present open to controversy. According to the

experience obtained in particular cases we should be justified to adopt a priori the theory of absorption by the skin. It is self-evident that the experience of such cases only can serve as proofs, in which observation has not been disturbed by similtaneous internal medication. I venture to enter into a case of my own practice, which afforded a true observation.

I was summoned to attend a infant eight days old, which breathed painfully and would not suck at the breast. The examination showed that an obstruction of his nose was the reason of it. As the child presented besides a senile look and marastic constitution, I thought his suffering were Coryza syphilitica. But as I was not quite sure in the diagnosis, I restricted myself in cleaning his nose and in applying ol. amygdal. dulc. to the cavity of the nose several times the day. After twelve days the whole body was covered with those well-known maculated eruptions of syphilis, which are visible only for the time where the warm parts of the body are denuded and then gradually turn pale and disappear, the more as the surface of the skin cools, just the point in which it differs from an innocent exanthema. I was no longer in doubt that I had here a case of syphilis neonatorum. As it seemed to me outrageous to give mercury internally to this stinted infant in so delicate an age I prescribed a sublimate bath daily (gr X a bath) and ordered the child to be nourished with

milk and a small addition of madeira. After four weeks the nose was free and the exanthema had disappeared. The body, faded in consequence of the marasmus, acquired strength and fullness, and a healthy complexion appeared in the place of the alternated features.

As the body was free from open syphilitic ulcers, which would have absorbed the medicament, the presumption is that the infant was cured by absorption through the skin. Why do we seek an explanation so far from us, which seems to be so near?

For the case before us, the explanation of the highly esteemed L. Lehmann: „A stronger sublimate solution destroys the epidermis, adheres, soaks into and affects it mechanically. The effect of sublimate can therefore give no proof of the theory of the diffusion through the skin in bathing*)" can find no application, it can only be determinative for stronger sublimate additions, as he himself also states. No one certainly would maintain, that after having added gr. X sublimate to a whole bath, the sublimate would still act corrosively, affect the epidermis and force its entrance into the inner liquids of the body. If gr. X sublimate added to a bath would corrode the skin, how should we dare to order the Liq. of van Swieten internally

*) Archiv. f. Baln. II, 4, p. 329.

(gr. X sublimate to 2 pounds corn-brandy. M. and E. one table-spoon full)?

Independently of the experiences, which we have made with patients and which seem to verify the absorption of the skin, we think there can be no reason to doubt its physical property and the very favorable organisation of the skin for absorption. We go upon the ground of its relative dryness, of its permeability in pursuance of which it exhales warmth, carbonic acid and water-gas (perspiration of Haller), on its innumerable evacuating canals of the perspiration- and sebaceous glands (see fig. 6) with which it communicates with the external world and on the close net of fine blood-vessels, which are spread under its surface. In our days that belief has been deeply shaken through experience; but as the acts are not yet closed in respect to that question and the pro's and con's evidently not decided, we are obliged for the present to be satisfied with that which science has settled. It would lead us too far if we were to discuss the difficulties which here embarrass the search after truth, though we have already partly triumphed over them. — It is a pity, that the different experimenters are not seldom at variance in their reports and even differ so much in their opinions in cases where they obtained the same results, which will never lead us to the long desired end. However if eventually the absorption by the skin could not be

proved, the empiric fact of the sanative power of the baths would never be overthrown.

The results of the experiments, which speak for the absorption, are the following:

1) The augmentation of the weight of the body in the bath (Valentin, Berthold, Alfter, Willemin).

2) The increase of urine-secretion after the bath*) (L. Lehmann, Merbach).

3) The increase of solid matters in the urine, especially of urea after the bath (L. Lehmann).

4) The disappearance of thirst during and after the bath**).

5) The quantity of the matters of the insensible perspiration is augmented after a brine-bath (L. Lehmann).

6) Jodine is to be traced in the urine of individuals after having taken baths of Jodine and making use of bathing-tubs with closely shutting covers so that only the head of the bather projected and the reception of Jodine through the lungs was quite impossible (Waller).

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*) The increase of urine after the bath is explained by Merbach through the interrupted perspiration and increased secretion of the kidneys during the bath and by Lehmann through the irritation of the nervous system of the skin caused by the bath.

**) Falck explains the disappearing of thirst after the bath by the contact of the extremities of nerves in the throat with the aqueous vapours and by the increase of the secretion of saliva.

The absorbing property of the skin in respect to Jodine cannot be denied (Waller, Willemin, Rosenthal, Demarquay).

7) Mercury in the urine could be proved after the use of sublimate-baths by means of electrolytic researches; in some cases even salivation set in after a long continued use of sublimate baths (Waller).

8) The resorption of carbonic acid through the skin is indubitable (Legallois, Hamburger, Kisch).

Against the absorption speaks:

1) The diminution of the weight of the body in the bath (Kletzinsky, L. Lehmann).

2) The diuresis augmented by the bath does not coincide with the secretion of the chloride (L. Lehmann, Benecke).

3) The salts of lime are not augmented, as would certainly be the case, if the increased diuresis were the result of the resorption of the bath-water (L. Lehmann).

4) A thinner urine is not to be observed after the bath (Falck).

The second explanation, how brine can exert its effect on the organism, when using it externally, is that which will be deduced from its physical action on the skin.

The naturel property of the different constituents which are in the brine is to exert an irritation on the fine and utmost peripheric extremities of the nerves,

which are embedded close under the skin. The temperature of the bath, its warmth, by which mortified scales of epidermis are quickly loosened and rubbed off, favors that process. This irritation is conveyed to the central organs of the nervous system, to the brain and the spinal marrow and reflected from thence to the different organs of the body, which serve for secretion and excretion, there to call forth a strong reaction of the vessels and nerves, to raise the energy of the capillary circulation and to animate and accelerate the whole transelementation.

All baths contain constituents, which are suited to irritate the skin and therefore to raise the transelementation. On indifferent springs the higher temperature undertakes this part, as warmth is also a powerful excitant, the rousing effect of which on the activity of nerves and circulation is not to be denied. If that explanation of the effect of the baths, which may be traced to its physical influence, should suffice and the absorption of the skin were to be disowned, the chemical composition of the springs would be quite irrelevant. It would then be the same whether one bathed in iron- sulphur- or chloride of sodium-water or in any other indifferent thermal water. The physician must then be further allowed to put the whole pathology, as far as it concerns balneology, under the protection of his Naïad.

But the sphere of action of a spring is bound to limits, which nature has settled quite distinctly and which cannot be arbitrarily extended. We cannot at all admit that this fact depends only on the internal use of the waters, but also on its external use and therefore we may well believe in the absorption of the skin. If we have indeed not found till this day the key to the mystery for all constituent parts of the springs, let us look to the future! It must solve for us the enigma!

But how shall we explain the phenomena, that very often the most different diseases, though ariving from heterogeneous causes, are treated with success, even in cases where the choice of the bathing-place was a mistake or the spring not rich enough in powerful agents? By far the greatest part of this favourable result does not come in such cases on account of the spring, but of the happy outer conditions, which the sojourn at a bathing-place offers, a factor which weighs heavily in the scale. In that respect we reckon: the sojourn in a romantic country, the change of air, the release from pressing professional duties, the dolce far niente and the living together with so many who have the same object in view, who hasten towards the same goal, who live only for their health, who think of nothing further than how the day is to be spent agreeably. Who does not know the salutary influence which a journey exerts on a sick organism? How

much more will be gained by a sojourn at a bathing-place where there are no hardships, nor fatigues and where diversion, repose and recreation proffer their aid.

D. Indications of the Mineral Waters of Kreuznach.

As the action of our salt-springs may be traced, as we have seen above, to two points: to liquefying and dissolving exsudations and to stimulating and accelerating the transelementation, there will result two indications of the brine:

1, Exsudations, Infiltrations and Hypertrophies

or

diseases in which especially the resorbent action of the brine is to be considered — an action which removes local maladies — and in which the body is preserved from new accumulations by normalizing the transelementation.

1. Scrofulosis.

Kreuznach, in virtue of the favorable result of its brine, has gained a well-merited reputation as a specific against this malady.

If we enter into the nature of that suffering we see the different forms under which it appears and according to its locality the ravages which it can cause.

Scrofula arises chiefly from a perverse course of the digestion and several other processes which serve

to the formation of blood. In consequence of it the disturbance in the alimentation calls forth inflammations and swellings in the different systems of the body, particularly in the lymphatic glands, in the external skin, in the mucous membranes, in the joints and bones, which differ from other inflammations and hypertrophies in their great pertinacity and most chronical course. But a long time before scrofula becomes localized, the diagnosis of the main-disease is clearly expressed in the specific habitus of the scrofulous patient, which can be a twofold one. That anomaly of the nourishment provokes either an abnormally retarded transelementation which promotes the production and accumulation of fat at certain parts of the body particularly at the upperlip and nose, or an abnormally accelerated transelementation which is attended with a deficient development of the panniculus adiposus of the skin and the muscles (Niemeyer).

We distinguish therefore a torpid-scrofulous and a florid-scrofulous habitus. The former appears in an indolent spirit, coarse features, spongy and bloated body, swelled lips and wings of the nose, a large, often angular cranium, inflated stomach and swellings of the glands.

The latter is characterized by a vivacious, sprightly spirit, fine features, languishing eyes, pale-red lips and cheeks, a dazzling white skin with blue and rose-red

gleaming veins, thin, mostly light, soft hair, slight, graceful skeleton and slender and delicate body.

Scrofula, tubercula and every other malady of the parents, which destroy the constitution, can be the germ of the scrofula of the children. A too unequal age, particularly a too advanced age of both parents, may cause inborn scrofula.

Scrofula is not alone transferred to children by old, feeble and sick parents, but is as often acquired after the birth. Circumstances promoting its development are coarse food, indigestible and little nourishing to the delicate childish organism, want of exercise, bad nursing, uncleaness and the abode in damp or dark dwellings.

Scrofula is a malady of infancy and childhood; however it can also be developed in an advanced age, if those pernicious circumstances act with greater force.

Even the popular saying: „The child has glands" denotes that scrofula becomes localized firstly and by preference in the lymphatic glands. The lymphatic glands on the surface of the nape, in the region of the Parotis, under the lower jaw, at the neck and at the flexion of the joints as well as at the knee-joint, the groin and axillary cavity are not the only seat of scrofulous swellings but also the deeper lying glands in the lungs and mesentery. — These hypertrophies with their plain surface are easily distinguished from malignant tumors, which show notoriously a rug-

ged form and are not to be confounded with other swellings of the glands which surround the neck — e. g. in dentition and in scrofulous head and face eruptions— and which have only the importance of consensual buboes. Scrofulous individuals suffer from increased vulnerability. I saw not seldom how the inflammation of a simple incision into the finger, in the beginning insignificant, extended along the lymphatic vessels of the arm and produced a large gland-swelling in the armpit.

The termination of the scrofulous swellings of the glands is either resolution and returning to the normal and physiologic condition or inflammation, which mostly ends with suppuration and breaking out externally. In the latter case the loose contexture in which glands are bedded is drawn into the sphere of the inflammation and, when pus breaks through, forms an ulcer with flaccid, reddish-violet, unequal, pointed borders of a larger extension than the original swelling of glands, which leaves only a disfiguring, callous, creeky cicatrix after its curing. When pus does not break through it undergoes a cheesy metamorphosis, dries and shrinks to a limy chalky mass or melts anew, undermines the neighbouring contextures and causes at last, transformed into destructive ichor, likewise an ulcer.

If we do not put a stop in time to this disease of the glands, the patient is exposed to danger, espe-

cially of inflammation and suppuration of the bronchial and mesenteric glands.

The swollen bronchic glands can cause in the lungs asthmatic fits by their pressure on the nerves and inflammation and chronic bronchial catarrhs by irritating the neighbouring contextures. If one had occasion to see, what enormous masses of mucus are expectorated, particularly on awaking in the morning, one would feel tempted to believe, that a vomica was evacuating, if the physical examination of the lungs did not convince us of the contrary. We have then a hard task to calm, by explaining the nature of the suffering, the alarmed patient and his relations.

The enlargened and hardened mesenteric glands of the abdomen, which are sometimes felt as lumps through the tegument of the abdomen, can cause colic pains by their pressure on the intestinal nerves, and chronical catarrhs of the intestines by the constant irritation which they exert. At the same time the abdomen is full swelled, because the badly nourished intestines cannot oppose the necessary resistance to the expansion of the gases.

In both cases the sad catastrophe may end with corruption of the juices of the body, hectic and dropsy.

The scrofulous affection of the skin form e i t h e r ulcers, which, besides that they are developed out of spontaneous inflammation and exulceration of the skin,

can also arise from inflammation of intumesced glands, or exanthemata. The latter appear in the earlier periods of life under different forms (see diseases of the skin). The eruptions at the head and face are the most usual. Lupus scrophulosus is more seldom and belongs more to advanced age.

The scrofulous inflammation of the mucous membranes cause different local affections according to the organ in which they take their seat, as in the eye and its appendages inflammation of the binding membrane and the lachrymary bag with excretion of caustic tears mixed with pus. The conjunctivitis is seldom alone, but generally proceeds to the Meibomian glands, the roots of the eyelashes and the cornea with increased aversion to light, producing phlyktaenides and ulcers of the cornea and not seldom leaving dullness and cicatrices behind for a long time. The scrofulous ophthalmies are particularly distinguished by a very chronical course and a great inclination to recidivation. The scrofulous inflammation of the mucous membrane produces: Otorrhoea in the ear, which often leads to carious destruction of the os petrosum, further coryza in the nose often affecting the bones, then in the lungs and the mouth, intumescence of the tonsils, catarrhs of the tuba Eustachii, the throat, the larynx and the bronchia, finally chronical diarrhea of

the intestinal canal and fluor albus of the female genitals.

In the joints the scrofulous inflammation appears seldom as acute inflammation, passing progressively into a chronical one; on the contrary, it generally takes from the beginning the chronical character and indeed among all manifestations of scrofula, the joint-inflammations are those which show just the tendency of scrofulous maladies to become chronic. Particularly the inflammation of the synovial capsule (Synovitis) can proceed without any pains or any other phlogistic symptom, so that the hydropical effusion into the cotylas only can explain the nature of the malady and inform us, that we have here an inflammatory process. The inflammation may choose as an outlet, besides the synovialis, the external skin, the cellular tissue which surrounds the joints, the mucous bags, the ligaments of the joints, the cartilages and the spongy extremities of the bones, confining itself to them alone or implicating the whole joint in the process by means of communication from one of these parts to the other. The inflammation may end in resolution, without leaving behind any other injury to the joint. But if the inflammation is not resolved, suppuration takes place, generally breaking out externally. If the inflammation, having attained a larger extension, ends in that manner, it

will leave in the most fortunate cases, owing to the consolidated exsudations, incrassation of the ligaments and the neighbouring cellular tissue, which will be attended with intumescence of the joints and restriction of its movableness. But not seldom the inflammation has a great intensity to carious destruction of the bones. There are particularly the spongy parts of the bones, the epiphyses of the hollow bones, the vertebrae (Spondylarthrocace), the bones of the wrist and tarse, which are seized by the destruction. If that process has also gone off, relatively happily, when suppuration finally creases and the fistolous canals close, leaving behind deep and funnel-shaped cicatrices, the s o l d e r i n g of the bones with an abnormal position of the joints, caused by contraction of the limb, after a partial destruction of the bones, occasioned by the caries, gives the final scene of the greater degree of this malady.

Though even many of the enumerated scrofulous affections may be found in one and the same individual, they will scarcely all be found associated. Therefore the appearance of the malady is not alone subjected to manifold changes, but there often remains even for a long time after the cure a weakness and a sensibility in any part of the body (locus minoris resistentiae) which on every occasion, on the most trifling cold soon causes a relapse.

It is easily understood, after having explained its

action, that our Waters perform in the Scrofulosis its most excellent services and celebrate here its most brillant triumphs. We succeed in these cases not only in mastering happily the different scrofulous affections through resorption of the exsudations but also in destroying the malady in its roots by regulating the transelementation. An advantageous change in the whole habitus of the patient sets in with the amelioration of the different vital functions. — Physiognomies which can by no means be called beautiful can really become so.

We must attach an importance to the regulation and the superintendance of the diet, which is to be observed during the cure. We must never overlook the fact, that unsuitable nutrition is the principal cause of the scrofula, a neglect you will find as well in the cottage of the poor, where the child sickens in consequence of coarse, badly nourishing food or even want of nourishment, as in the palace of the rich, where an exceeding supply of nourishment is the cause of the anomaly. But we must also consider the form of the scrofula which is to be cured. A strong individualizing is here the inviolable duty of the medical adviser; for we apparently come upon a contradiction of the effect of the brine, if we declare it adapted for both forms of scrofula. However the whole secret lies only in the regulation in the drinking and bathing

of the waters and in the choice and quantity of the proper food which is to be adapted to the special case. We favor the effect of the brine, the acceleration of the metamorphosis of the matters and the increased consumption, by giving animal food in a moderate manner, by which we contribute to a better production of blood, in cases of torpid-scrofulous habitus, where a retarding transelementation and a diminished consumption are the essence of the scrofulous diathesis. We therefore allow meat only once a day in order not to hinder the action of the brine by supplying too much.

In the erethic form on the contrary, we may compensate the abnormally accelerated transelementation of the florid-scrofulous habitus with a substantial nourishing diet, extending it also to supper. If we take the precaution to allow daily only a small quantity of our water and baths of a short duration and without mother-lye, the effect of the brine, the augmentation of the metamorphosis of matters, will be less apparent, but we will nevertheless bring about a regulation of the digestion and amelioration of the nutrition and, therefore, attain happy results.

Chronical diarrhea requires special consideration. The application of the brine must be here limited to external use; for, if given internally, it would augment the irritation of the intestines. When the or-

ganism has been sufficiently strengthened by red wine, good beer, raw minced beef, soft eggs etc. and by baths and when the ceasing of diarrhea proves, that stomach and intestines are in a better condition, then only may we allow first some iron-water and lastly our waters. In order to shorten the process in the intestinal canal, we use during the cure injections into the rectum (in the beginning luke-warm, afterwards cold). We begin with mucous remedies, gruel, starch with opium, then we go on to milk and further to common water and solutions of Nitrate of silver, strengthening them gradually. — At last we use also our mineral water.

The local application of the brine, beside the drinking- and bathing-cure, is used in many ways for sundry scrofulous affections, as in the shape of fomentations in the case of scrofulous ulcers and abcesses; as a gargle, with or without a small addition of mother-lye, for catarrhs of the throat, swellings of the tonsils and ulcers in the mouth; for inhalings into the nose in Coryza; as injection-liquid in Fluor albus; as an eye-bath, by means of the eye-cup or the douche, in maladies of the organs of sight; and as hydropathical envelopings; and as douche in sufferings of the joints.

If the scrofulous inflammation of the joints is restricted to the synovial capsule, if we have a real

Synovitis, we might stop the suffering for a short time by applying pressing bandage, by vesication or ferrum candens; but it will soon reappear in the same or another joint. A total cure can only be attained by a reform of the whole constitution under the influence of our waters.

If further the joint-sufferings, in which the synovial membrane and other parts of the joint-apparatus participated with the inflammatory process, have passed off without doing great damage, if there are only swellings of the tender parts and slight intumescence of the bones and if the moveableness of the joints is not too much injured, we may expect a happy result from the cure by the simple use of the brine. But, the case will be quite another, if hypertrophies, cementing and displacement of the bones and, therefore, a partial or total suppression of the moveableness of the joints (Anchylosis) with a perverse posture of the limb, dependent on contraction, remain after the inflammation and the carious destruction. That would indeed be extending the action of brine too much, to hope for a happy result in those cases also. At all events, before we can begin with the drinking- and bathing-cure an operation must first take place, in order to break the solid exsudations (Adhesions), to restore the natural posture of the limb and to give moveableness to the joint. — The following use of our

waters will then bring the exsudations, which had not been removed by the operation, to resorption and, therefore, restore the moveableness of the limb and guaranty recovery by an amelioration of the whole constitution.

Anchylosis in both Knee-joints cured by one forced stretching and the subsequent use of the waters of Kreuznach with the restoration of shape and motion as far as possible.

Anamnesis. Louisa Leiendecker, $15^1/_2$ years old, was born at Spabrücken, a village in the neighbourhood of Kreuznach. Her parents, though living in the most indigent circumstances, enjoy till this day a perfect state of health. The patient herself spent the first time of her childhood also in the best health. Eight years old, she went to church in the cold days of March, having just left the warm room and after being about an hour kneeling there, she fainted away. Scarcely was she brought to consciousness and taken home, where she arrived trembling and almost benumbed, than she was seized with convulsions in such a degree, that the parents stood in fear of their child's life. However the danger passed, the convulsions ceased totally after two hours and the patient seemed to recover. But the following morning, she complained of pains in the knees, a violent inflammation of both knees having developed itself; at the same time larger and smaller pustules appeared, partly isolated, partly

in clusters. The latter were to be seen particularly at the chine-bone and about both the great trochanters. The pustules soon flowed one into another on these three places and formed larger abscesses which later broke up and poured forth an abundant pus. The medical man ordered cod-liver oil and a simple bandage with lint. But unfortunately the abscesses would not heal; on the contrary they still secerned pus, when the patient attained her 14. year. During this long period

Fig. 3.

of 6 years, which the patient spent continually in her bed, tormented by the most violent pains, both the lower extremities contracted gradually more and more and remained at last, the inflammation of the knee-

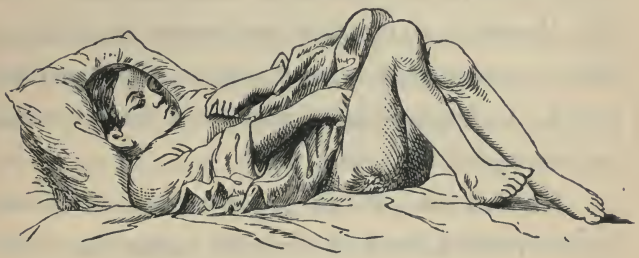
joint having ceased, in an anchylotic posture. — At the time, when I became acquainted with the patient, she being 15 and a half years old, the abscesses had at last closed, the pains ceased, but she felt quite unhappy at the sight of her contracted limbs and the loss of all free motion and wished most ardently to have them straight anew and to be able to go about.

Status praesens. The patient is middle sized and of pale complexion. Though the upper part of the body is tolerably developed, she is in general backward for her age. The thin, light and scanty hair, the bloated face, the large wings of the nose and thick upper lips represent evidently the torpid-scrofulous habitus, which we often see among the poor population as the result of a continual insufficient and bad nourishment. Lungs and heart perform their functions regularly. Appetite, sleep and stool leave nothing to be desired. The menses have not appeared till this day.

The lower extremities, having remained so many years in inactivity, are formally atrophied, particularly the lower parts of the legs are spindle-like without any trace of calf (fig. 4). We perceive on the chine-bone and on both cheeks of the posterior, upwards from the great trochanters, hand-broad, intensely red-coloured, deep cicatrices, which have remained after the closure of those large abscesses (fig. 3 and 4). There are

also great cicatrices on the knees and smaller ones on sundry places of the extremities which all originate

Fig. 4.



from those pustules. — The knee-joints themselves are not quite firm but show a slight degree of moveableness (Anchylosis spuria). Besides the Anchylosis and the cicatrices we discover, it is true, nothing else of irregularity on the left knee, but, that cannot be said of the right one. The patella, though still to be moved a little, is here outwardly and downwardly dislocated, so that its lower edge stretches much over the Capitulum fibulae. Tibia and Fibula are not opposite the condyls of the upper thigh, but the latter is cucullated and extends beyond the former. (Subluxation of the lower part of the leg in the back). The internal condyl of the upper thigh is considerably hypertrophied (fig. 4.) — As in the latter years the patient could

only move by sliding on hands and knees, we find on both knees a hard callus. We see a similar callus on the inner flat of the right foot, originating from the pushing forward with the right extremity, which the patient used to do, when lying on the left side. The foot, therefore, is deformed and turned outwardly in such a manner that a small degree of flat foot has formed. Under this callus there is a fistula, which has suppurated for a long time.

Operation. If we consider that the patient has not touched the floor since the eighth year of her life, if we see, how she crawls on hands and knees, and learn that she cannot read and write, though a girl of 15½ years, having been unable to go to school and too poor to receive any private instruction, we must think ourselves happy that the honourable von Langenbeck has given us the means in the Brisement forcé to restore her not only upright limbs and an erect humain gait but also the possibility of making up for the culture which she had been obliged to neglect in her unhappy childhood.

The patient having been removed from her home on the 18. April 1859 and having obtained a more healthy appearance through the influence of substantial food and better care, on the 1. June the operation of the left extremity was proceeded in the following manner. To the patient lying on the back is given chloro-

form, and, the narcosis having set in, the girl is turned on the belly so that the knee, which is to be operated, lies on the corner of the operation-table and that the operator can bring down the lower part of the leg without any obstacle. Whilst one assistant fixes the pelvis, another the upper thigh and a third takes the knee in the hollow of his hand, the operator seizes the lower part of the leg with both hands, forming a lever, the Punctum fixum of which lies in the knee, and bends it so far down, allowing the flexion to return from time to time, till the curvature of the knee has totally disappeared. After that, the patient is relaid on the back, the narcosis ceased and the extremity is enveloped with a gypsum-bandage as far as the middle of the upper thigh. — Undoubtedly the gypsum-bandage is to be preferred to every other method (cold cataplasms, ice, leech-worms, Ungt. Hydg. cin. etc.) which are used to counteract the seldom considerable reaction after the Brisement forcé. No other remedy unites so many advantages as the gypsum-bandage, which acts by its compression as antiphlogistic, promotes the resorption of the blood-extravasations inevitable in this operation, and diminishes simultaneously the pains of the reaction, as the extremity is so firmly fixed that a shaking is scarcely possible. The only drawback that we could mention is, that it favors the formation of new adhesions, as it fixes the limb in a

quiet position for a longer time. But even that is refuted in practice; for the slight bending which the lower part of the leg undergoes on the ceasing the narcosis in consequence of the energy of the muscle-contraction, is removed with the greatest facility by using the machine after having withdrawn the gypsum-bandage (see below).

2. June. Patient has slept little, fever moderate, pains in the knee insignificant. Antiphlogistic diet.

3. June. Patient has had a better night, pains in the knee have almost disappeared.

4. June. Patient evidently comforted by the benefitting sleep during the night, is very merry, even frolicksome. The pains in the knee have totally disappeared.

5. and 6. June. The state of the patient's health leaves nothing to be desired.

8. June. The gypsum-bandage having been withdrawn to-day, the patella shows an insignificant blood-extravasation and its epidermis has loosened to a small extent. The little angle which had formed in consequence of the contraction of the muscles, when patient awakened out of the narcosis, disappeared on the moment where the machine (stretching machine with knee-cap) was put on and screwed straight, so that the extremity lay perfectly stretched out.

The operation of the left knee having been made with success and with a surprising result for so short

a time, I was willing to take up the operation of the right extremity, as the mobilisation of our army was announced and I was carried away in a few days from my sphere of activity hitherto. After its termination I returned the 4. August and found the patient in the same favourable state. The extremity was still perfectly straight, the little skin-wound on the Patella had closed and the blood-extravasation was resorbed. In the knee perfect motion was present, the passive totally, the active only to a limited degree.

I undertook the artificiel stretching of the right knee-joint on the 11. August in the same manner as with the left side. As the lower part of the thigh formed here a very acute angle with the upper part, I did not expect to attain a great success with one operation. But beyond all expectation I succeeded in such a degree that only a few lines were wanting, so that I could leave the rest to the action of the machine. The putting on a gypsum-bandage followed the operation immediately; not the least reaction could be observed; in the contrary, the patient moved the toes very quickly without any pain in the third day.

The bandage was removed the 20. August and I saw with pleasure that the machine had performed what I did not get with the operation i. e. that the lower part of the leg formed a straight line with the upper part.

On the morning of the 23. August I was called to the patient who complained of violent pains of the knee. As the whole extremity had considerably swollen, I thought it advisable to withdraw the machine and to remove all pressure. Pains and intumescence disappeared after eight days, so that I could venture to apply the machine anew, what I did with particular caution. At first I applied it but a short time, afterwards some hours the day, till it was to be endured throughout without any injurious consequences. On the 24. September I untertook, having put the machine on both sides, to make the patient stand upright on the floor and to get the first experiments of going with the aid of two crutches. To my greatest pleasure that first essay had a better success than was to be expected, if we consider, that the muscles of the extremities are atrophied in a high degree, that a certain portion of strength was necessary to lift the heavy machines and that the patient had not touched the floor for a long series of years.

Now that the right side, as above mentioned, showed a small degree of flat foot, I thought it necessary to apply also a remedy for that suffering. I gave therefore to the patient for the straightening of the foot a machine which consisted of a shoe, an outer and an inner steel splint. Both splints have a hinge at the foot-joint, reach the calf and are fastened to

a leathern laced stocking. It was found necessary to apply the same machine also to the left side, because the bandage-apparatus on the left foot-joint was so feeble, that it bent down outwardly, when patient was lying stretched, and turned out, when she walked, so that she touched the floor only with the edge of the inner sole. The application of the machine and spirituous embrocations gradually ameliorated the sufferings of the feet. Whilst now the patient made greater progress from day to day, the muscularity of the upper part of the thigh had increased to such an extent after a lapse of two months in consequence of continuous exercise and exertion, that the half tubes of the stretching machine were not able to lodge the upper parts of the thighs in their cavities and so had to be renewed. The same was necessary on both lower parts of the thighs and here not only in consequence of the growth of the calves but also in consequence of the machines above described for the flat foot, which must be worn under the stretching machines.

On the 27. January 1860 I gave the patient leave to return to her home; indefatigable diligence and perseverence had at last enabled her to walk in the house with the aid of two crutches, to stand upright even without them; the machine however was still necessary, as the knee-joints wanted the requisite power. She succeeds in passive movements as far as

the perfect bending of both knee-joints, only the active are still limited. The right knee, which is still prominent in consequence of the former subluxation of the lower part of the leg and the hypertrophy of the internal condyl of the upper thigh, shows that form which has been named: „walking stick." (The knee taken as head of the stick). The patella, though still dislocated, had a better position. We see on the left side, on the contrary a normal, well-formed knee. Whilst she will at last succeed in walking with the latter with perfect bending and extension without crutches, I think it very doubtful that she will be able to do so without the machine on the right side.

Fig. 5 shows the patient after thrice using our waters. In consequence of the drinking- and bathing-cures which the patient underwent she can now stand without crutches and machines. The suppurating fistula on the right foot has not only closed, but the patient has also made such progress in respect to her walking functions, that she is enabled to go the whole day as much as her business requires, though indeed with the aid of two crutches; further she has succeeded in travelling over a distance of 4 miles, though she needed 2 hours to it. We must not forget that independently the sufferings of both knee-joints a great feebleness in both ancle-joints is to be observed, since they remained in inactivity for eight years. — As now the girl possesses

in the left knee as much power as is necessary to execute all active movements in walking, she has put off the stretching machine and now makes inconstrained use of it.

Certainly we may feel satisfied, if we consider, that the patient lived in such poverty before my be-

Fig. 5.

coming acquainted with her, that she never had fed upon any thing but coffee and potatoes. She cried, when she was made to take meat for the first time. —

She could undertake the cure, each lasting four weeks, only by receiving aid from generous philanthropists. But after having received good and substantial nourishing diet during one month, she was obliged to return for the remaining eleven months into her sad home, which was not at all qualified to maintain and secure the progress the patient had made.

How much would have been gained, if she had lived in happy circumstances instead of languishing in such misery.

2) Rhachitis.

Rhachitis also is almost exclusively a disease of childhood. It represents also a general derangement of nutrition which affects the skeleton by preference and so causes a retardation of the ossification. Rhachitic intumescence is also to be considered as an augmentation of substances formed by a chronical blood-congestion. Some authors seek the real nature of this suffering in maintaining that Rhachitis is founded on a state not unlike inflammation (of the cartilages and periosteum) in consequence of which anomalous relations of circulation take place and hinder the deposition of salts of lime. Others trace the malady directly to a want of salts of lime. I do not venture to say decidedly, to which of the constituents of our water we

owe the effect in treating the Rhachitis, whether to the carbonate of lime which we bring into the body with the brine, or to the chloride of sodium, which removes the abnormal condition of the skeleton by its property of altering the whole organism. A better condition of the cartilages causes an ossification agreeable to nature and the normal formation of the bones.

From the fact, that the great quantity of common salt in the cartilaginous bones of the fetus diminishes after the ossification, follows that a part of the chloride of sodium must be applied to the formation of bones. It may be that we can conceive the essence of the Rhachitis as a want of common salt in the cartilages and that thereby the ossification is hindered. If matters stood so, we should need to ascribe the favorable effect of our spring in these sufferings to the chloride of sodium which we bring by means of the brine to the cartilages. In all cases common salt figures considerably in the formation of cartilages and, therefore, also in the ossification. The abundance of common salt in all new formations of cartilages and bones proves that, and certainly the remark of Moleschott (Der Kreislauf des Lebens) is to be interpreted in that manner, when he says: that the formation of cartilage is impossible without common salt and that the latter is to be considered as cartilage-salt.

As Rhachitis is to be reckoned among the im-

poverishing maladies, very substantial food must second the action of the brine. We have therefore to prescribe a very azotic diet (fresh, not smoked or salt meat, if possible it must be raw, at the farthest roasted or very little boiled, raw yelk of an egg with unboiled but warm milk) united with strengthening beverages such as coffee, beer and old, good wine, which retard the transelementation.

If the cure is undertaken betimes, it is possible to put an end to the abnormal condition of the skeleton with such a substantial regimen conjointly with our waters and cod-liver oil and to prevent the consequences of the Rhachitis, lasting for the whole life as: flexions of the ribs, therefore crookedness of the thorax and curving of the sternum (Pectus carinatum s. gallinaceum), deformities of the pelvis and curvatures of the extremities and the spine (Kyphosis, Scoliosis and Lordosis).

3) Hypertrophies.

Hypertrophy proper is founded on an exuberance of the normal texture-elements and shows, therefore, no difference from the structure of the organs where it has developed. Hypertrophy not seldom originates from stationary intumescence caused by chronic inflammations. However it is also often very difficult

to decide, whether that increase of volume is to be attributed to exsudations caused by inflammations or to organisations proceding from the former. The increase of substance caused by accumulation of exsudations and properly organized new formations have therefore been also named hypertrophies, as it is impossible to draw fixed limits.

a) Hypertrophy of the Salivary Glands.

The seat of this malady is generally the salivary gland (Parotis), seldom the submaxillary glands (gl. submaxillares) or the sublingual glands (gl. sublinguales). We will, therefore, principally occupy ourselves with the hypertrophy of the Parotis. This hypertrophy is formed either in consequence of a chronic inflammation of the mouth (Stomatitis) or in consequence of an obstruction of the evacuating duct of the gland. A induration of the Parotis may also remain after the Angina parotid (Mumps). This tumour differs from Carcinoma (Scirrhus and Fungus medullaris) in its movableness and absence of shooting pains and of Enchondroma of the Parotis through its softer condition. The disfigurement of the physiognomy, the tension in the face and the restraint of the masticatory movements caused by the tumour, awaken often the desire for an operation. However he who knows the danger of an

exstirpation on this place (bleeding to death or injuries of the nerves) and the suffering which follows (Paralysis of the face) will highly praise the service we render when we succeed in bringing the hypertrophy to resorption by means of our waters.

b) Hypertrophy of the Tonsils.

The hypertrophy of one or of both tonsils orginates almost exclusively in often recurring acute inflammations (Angina tonsillaris), less frequently out of an hyperaemy and still more rarely is it inborn. The Velum palatinum and the Uvula are generally involved in the process and are, therefore, in a constant state of intumescence. The inconveniences, which the hypertrophy of the tonsils occasion, are manifold: a weakened voice is the consequence of a simultaneously existing chronic irritation of the upper parts of the larynx; the speech is marred in consequence of the increased volume of the tonsils which allows only inarticulated tones to be uttered; swallow is hindered, the hearing is injured in consequence of the tumor before the mouth of the Tuba Eustachii and even suffocation is to be feared in consequence of considerable intumescence, if both tonsils swell to such an extent that they touch each other and simultaneously partly close the inner orifices of the nose (Choanae). If we add that the always

copious mucous excretions in the sinuous excavations of the tonsils cause a frequent hemming and that the stony concretions, which are formed in the gland-parenchyma bring on repeated inflammation-fits in consequence of the existing irritation, it will be evident, how burdensome even dangerous the hypertrophy of the tonsils can be.

The best way of removing hypertrophical tonsils is excision. However we also can promise deliverance from this pertinacious suffering to patients who fear the knife in recommending them a visit to Kreuznach. But a considerable hypertrophy requires an often repeated cure.

c) Hypertrophy of the Thyroid Gland (Struma glandulosa s. sarcomatosa s. lymphatica.)

We understand under the denomination: gland-goiter an irregular, more or less elastic, painless tumour on the fore lower part of the neck. The hypertrophy is either limited to a lobe of the thyroid gland or embraces the latter entirely. It develops mostly in scrofulous individuals, but is also formed endemically at some places, particularly in mountainous countries. If the intumescence gets a larger extension, its pressure on the larynx can cause a change of the voice (it becomes hoarser) and difficulty in swallowing and breathing which may increase to suffocation. At the

same time there are stoppages, varicous intumescences in the neck's veins. The blood, therefore, accumulates in the vessels of the head and not seldom causes cyanotic colouring of the face, dizziness, congestions, even apoplectic fits.

For the cure of the goiter we attach an importance to the Jodine, though small in quantity, and to the rich content of Bromine which are to be found in our waters. But I have prized the existence of these two constituent parts of our brine only for the gland-goiter, in which hypertrophical gland-masses form the greatest part of the tumour and I exclude all other formations of goiter, as the brine proves impotent for them. Its pregnant symptoms facilitate the diagnosis. The Str. cystica feels doughlike, fluctuates and lets the light shine through like the Hydrocele. The Str. aneurysmatica, which comes from an extension of the vessels of the thyroid gland, pulsates, reaches quickly a considerable extent and increases the above-mentioned disadvantageous influences to the highest degree. The Str. cancrosa (Scirrhus and medullary Sarcoma) is characterized by a hard and rough condition, by strong adhering to the surrounding parts and shooting pains, breaks open easily and presents a cancriform ulcer.

d) Hypertrophy of the Prostate.

Hypertrophy of the prostate develops after an inflammation of the Collum Vesicae and of the prostate, after a protracted gonorrhea, after a catarrh of the bladder, after the recovery from syphilis, often even after a simple cold; but I have also observed the hypertrophy of the prostate in advanced age without any demonstrable cause.

Hypertrophy embraces either the whole prostate gland or restricts itself to one lobe, by preference the middle, and presents then an intumescence in the Collum Vesicae (valvula vesico-urethralis) pressing forward the mucous membrane and creating dysury which occasions the most distressing pains. At the same time the patient feels a continual pressing in the rectum; the stool is tardy. A copious secretion of Humor prostaticus takes mostly place out of the Urethra, which soils the linen and may subject the patient to hypochondry, as a longer continuance induces him to attribute that effluence to an incurable gonorrhea or even to a permanent spermatic loss. In frequent cases the bladder suffers but secondarily (Catarrhus Vesicae). In severe cases the patient is in real danger, when the hypertrophical lobe lies before the outlet of the bladder and therefore raises dysury to decided ischury. The hinderance, caused by the tumour projecting in the

Urethra, can be so considerable, that the introducing of a catheter in the usual manner cannot be managed. I therefore was often in the beginning of the cure obliged to penetrate the anus and to lift the lower part of the catheter with the tip of my finger over the intumescence.

The external and internal use of our waters, particularly its application in the shape of cold clysters every evening gives the finest results*). In the beginning the patient succeeds in retaining but a small quantity of our brine for a short time in the rectum, however he will soon take up larger quantities of the liquid for the whole night and without much difficulty. Thereby the brine comes for a longer period in direct contact with the hypertrophical gland-substance and is enabled to display its resolving action to the best advantage. At the same time the solid faecal masses are macerated and made movable. The patient, therefore, feels disburdened already in the first days of the

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*) That experience is also proved by observations of English physicians. Thus Mr. H. Thompson of London has for a long-time prescribed in prostate hypertrophies with a very favourable result clysters with an addition of our mother-lye. (One drachma of mother-lye of Kreuznach, 3 ounces Dct. Sem. Lini and 5 grains Jodide of potash, at times also some opium). He orders simultaneously sitting-baths to which 1 pound mother-lye of Kreuznach is added. (See Allg. Balneologische Zeitung I. year, 6. part).

cure and feels happy by the defecation, which regularly takes place every morning. If there is also blennorrhea of the bladder, shown by mucous flakes, and, at a higher degree of the suffering, by milky mucous clouds in the urine, or if blood runs out of the urethra even after the gentlest introduction of the catheter, which causes us to conclude on a considerable loosening of the mucous membrane or even on a fungous exuberance in the environs of the prostate, we endeavour to appease these irritations by injections into the bladder. We begin with mild remedies, with a mucous or oily injection-liquid: as milk, almond milk, Dct. Semin. Lini, Althaeae, barley-water (at first lukewarm and then cold) and pass over to cold common water and then to a feeble Solutio argenti nitrici.

c) Hypertrophy of the Testicles.

The hypertrophy of the testicles is a consequence of Orchitis. The hardness and generally rugged condition of the tumour gives at first the impression of a carcinomatous degeneration. The diagnosis however is secured by the absence of shooting pains and anamnestic facts.

A malady of a specific nature is the volume-augmentation of the testicles, which we call syphilitic Sarcocele. It belongs to constitutional syphilis of

which hereafter. It is, properly speaking, an inflammatory affection of the testicles, the very protractive course of which misleads us to take it for hypertrophy.

f) Hypertrophy of the Breast. (Mamma).

Female maladies.

In respect to their structure, the breasts belong to the botryoidal formed glands. The single Acini are fastened to each other by richly fat binding contexture and guarded outwards by a thick fat-cushion extending below the skin. Answering to this anatomical construction, the gland-lobes, the fat and the binding contexture are affected by the hypertrophy of the breasts, either simultaneously or excluding more or less one or the other of these formations. The pathological process is either confined to a small part or it embraces the whole breast. The tumour is moveable and only painful in the beginning, when its development is rapid. It is hard to the touch and presents an uneven, even rugged surface. If there are cysts at the same time, they can be recognized by the fluctuation. The neighbouring lymphatic glands are exempted and upon the whole the general state of health is not troubled. The hypertrophy may seize simultaneously one or both breasts; it starts either from a mechanical injury, a contusion, or an inflammation, or it develops in connection with the different

epochs of the sexual life of the women: puberty, pregnancy, lactation and climacteric years, if these periods, so important for the female organism, should have taken an irregular course. These disturbances are of manifold nature, but the irregularity of the menstruation are particularly to be accused as the cause of the hypertrophy of the breast.

The obstinacy, with which indurations after an elapsed Mastitis remain for many months, even in spite of all therapeutics, is well known and that is the case in a far greater degree with the hypertrophy of the breast. For this reason one use of our waters will but seldom succeed in resorbing it completely; on the contrary, the cure must be repeated several years in succession. Even then we only attain a stationary condition of the tumour, a result which will generally satisfy the patient, as she is free from the necessity of an operation, if the intumescence is not too considerable and does not cause too much ailments.

g) Hypertrophy of Ovaries. (Ovaria.)

The hypertrophy of the ovaries is almost exclusively observed only after a preceding Oophoritis. This etiological fact and some other criteria give a support for the diagnosis so difficult in consequence

of the great number of other ovarian tumours. If the inflammation was concentrated in the ovaries, the tumour is moveable and floats freely in the abdomen; it is, on the contrary, fastened to the adjoining organs by means of exsudations, if Metritis or Peritonitis existed along with the Oophoritis, which will be often the case in childbed. Besides, the tumour is painless, seldom surpasses the size of a fist and does not show any directly disadvantageous influence on the organism. However the change of the ovarian texture hinders the ovulation regularly setting in and causes therefore amenorrhoea and the impossibility of a conception, if the malady is developed on both sides. Now, if we, in using our waters, reduce the ovaries to their physiological condition, we put an end to that menses-anomalism with all its consequences, so pernicious to the female organism, and, therefore, also remove sterility.

h) Hypertrophy of the Womb. (Uterus.)

The hypertrophy of the uterus consists in an increasing of the mass of the uterine contextures, which takes place in the under segment of the uterus, in the neck of the womb, or it extends on the uterus partially or throughout. In the first case the vaginal portion, particularly the fore lip of the uterine mouth is for the probing finger deformedly swollen,

lengthened and therefore hanging down in the vagina. The diagnosis is the more difficult in consequence of the liability to mistake it for other tumors of the womb, if the hypertrophy has its seat in the upper parts of the uterus. The following points are leading: The tumour which is to be felt through the walls of the abdomen, does not grow constantly as during the pregnancy, but only reaches a larger dimension after years. The regular three or four weekly type of menses is altered, the quantity of the secerned blood is diminished, indeed the menstruation can be quite interrupted by it. A considerable increase of volume of the uterus hinders not only in consequence of the pressure the function on the adjoining organs, the bladder and the rectum, but causes even hydropical intumescence of the lower extremities. The Fluor albus, coming almost simultaneously, with its influence exhausting the strength of the patient, united with the symptoms above described, causes that malady to be one of the most painful.

The mission of our water is here a double one: not only to improve the constitution, but also to remove the tumour and its injuries and dangers.

As we are treating here the region of female maladies, we may mention some other shapes of diseases of the sexual sphere of women, the cure of which has given the well renowned reputation to Kreuznach and to its waters.

Chronical infarction.

According to v. Scanzoni we can only consider as hypertrophies of the uterus those increasings of volume of the womb which cause a real increasing of the muscular fibres and a perceptible enlargement of the vascular apparatus of the uterine walls. It would be quite another thing with chronical infarction which had been provoked by an accumulation of binding contextures only and which would be derived from hyperemical and exsudative processes. As the chronical infarction mostly remains after an acute Metritis, we have given also the name of Metritis chronica to that malady. But preceeding Metritis acuta is not alone the cause of the chronical infarction, we find it also in abortions, which took place several times in a proportionally short space and where a new conception did not allow the uterus to be completely restored. We therefore observe the chronical infarction not seldom after a confinement, where, from whatever cause, the involution of the uterus has been injured. It is further self-evident that the chronic infarction will accompany all those sufferings of the uterus (tumours, accumulation of secretions, inflexions and anamalous conditions) which cause a constant irritation of the uterine walls and therefore occasion a stoppage (Stasis). The hyperaemies of the uterus, originating in violent dysmenorrhoic fits, cause also at last chronic intumescences of the generative organs. These

genetic facts, the scanty, mostly painful menses, the more or less porfuse secretion of mucus, the enlargened vaginal portion, mostly covered with ulcers, the resistant lower segment of the not seldom voluminous uterus, a feeling of heaviness in the abdomen, injuries in the functions of the bladder and rectum (obstruction and repeated pressing to stool and urine) caused by the pression of the enlargened uterus, and the pains, which take place in consequence of the pressure on the pelvis nerves, are determinative in the diagnosis of chronic infarction.

The usefulness of our waters especially for these cases in consequence of its resorbing power is proved by v. Scanzoni's own words, a man of a large experience: „If the circumstances of the patients allow it, we would direct them to take a bathing- and drinking-cure for several months in one of the above-mentioned watering-places, among which the Mineral Waters of Kreuznach and Kissingen deserve particularly to be mentioned in respect to their salutary action in diseases of the uterus."

The application of the brine by means of compresses spread over the hypgoastrium and in the shape of vagina-douches besides the use of the bath and the drinking our waters is very valuable for hypertrophy of the ovaries and the uterus as well as for all the sufferings spoken of above. As in daily prac-

tice we use moist warmth (warm cataplasms) as a remedy to soften indurations and solid exsudations, the use of warmth combined with the brine, in order to raise its resorbent property, lies hard by hand. In attending maladies under consideration we therefore warm the brine before applying it as compresses or injection-liquid. This proceeding has however an exception, when bleeding takes place from the genitals, as in the case of flexions of the uterus (Ante- and Retroflexio uteri), which forbid the use of the warmth. In such cases we must apply cold injections in order to prevent Chlorosis and Marasmus.

Leucorrhea.

On the other hand we give preference to cold brine in all those maladies, where it is desired to moderate a hyperaemy of the genitals, to remove the loosening of its mucous membrane, to diminish its secretion by means of the contracting property of the cold. The cold injections of brine find therefore their application in chronical catarrh of the uterus and the vagina. That suffering appertains particularly to the scope of the spring of Kreuznach, when it is founded on a constitutional base, on scrofula or chlorosis; here we attack the symptom, the catarrh, with the brine and under its action also both maladies find their cure, so that we secure a lasting recovery by means of raising the constitution. It further may be mentioned that, if the content of iron

in our waters should not be sufficient to suppress a perhaps too high degree of chlorosis, we have recourse to any of the chalybeate waters for internal use.

But there are not only leucorrhoeae, united with both mentioned constitutional maladies, which are to be cured at Kreuznach, the catarrh may be quite as often traced to causes which have acted locally upon the mucous membranes in question, such as catching cold, dislocations and tumours of the uterus or maladies of the ovaries etc. The pertinacity of such a fluor albus, having often defied the skill of the physician for years, makes it explicable, how even patients for whom our watering-place is not strictly suited, look for help from us. In that case it is self-evident that, if the causal fact of the uterine and vaginal catarrh is an incurable suffering, we can not reckon on a cure, but at the most on an improvement.

Ulcers of the vaginal portion.

We have to pay a particular regard to the ulcers of the vaginal portion of the womb which are scarcely never absent in cases of uterine catarrh. They appear either as single, large, superficical erosions and excoriations or as deepgoing, granulated ulcers. Their removal is to be desired as they cause during their stay a continuance of the catarrhal secretion, and, if early accomplished, it prevents inflammatory exuberances of the cervical mucous membrane and coales-

cence of the uterine lips during the formation of cicatrices, and therefore the straitening of the Canalis Portionis vaginalis and imperforation of the uterus and its consequent sufferings (Hydrometra and Haematometra).

If we do not succeed in curing the ulcers with the single use of brine, we apply simultaneously Argent. nitr. in substance and in pertinacious cases even Ferrum candens.

New formations in the uterus.

Respecting new formations in the uterus we cannot expect that the brine would cause a diminution or a perfect resorption of the tumours per resorptionem. The same holds good in the cases of cysts and ovarian fibroids.

However, a great many women, who suffer from those maladies, are sent to Kreuznach, partly to calm them, not to rob them of the last anchor of hope and because humanity commands, that they shall not be left to their fate, partly because experience has shown, that not seldom our waters have accomplished a station of the pathologic formation, even when its resorbent action was not efficacious. Furthermore it must be owned, that our spring has removed hypertrophies of the uterus, which had secondarily developed themselves in consequence of a long lasting irritation, such as for example fibroids exert on the uterine walls and that, therefore, consequent diseases have

been made impossible (neuralgies, uterine colic, bleedings). At all events an improvement in health and strength are to be observed. There are even cases, where fibroids of the uterus have disappeared per suppurationem in consequence of the drinking- and bathing-cure. This process has an analogy to the intumescence, painfulness and inflammation of scrofulous gland-tumours, which symptoms are so frequently to be observed on using the brine. But a small step leads from inflammation to suppuration and here we have the possibility of removing fibroids with a cure of several weeks at Kreuznach, though it has hitherto defied all therapeutics.

4) Diseases of the skin.

Among the maladies of the skin, only the chronical exanthemata are of interest to us here; for as long as symptoms of inflammation prevail, it will be always a hazardous, even dangerous undertaking to subject the patient to the bathing-cure. In following the pathological and anatomical mutations of the skin, which Niemeyer describes in his excellent „Compendium of special pathology and therapeutics“ and his division of the dermoid diseases, we shall consider only

the cutaneous ailments for the healing of which our waters already enjoy a well-spread reputation.

Fig. 6.

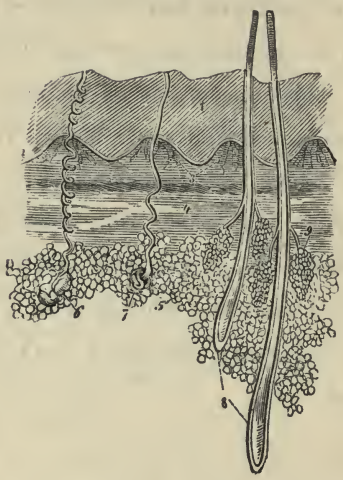


Fig. 6 (According to Wilson-Hollstein). A intersection of the exterior skin, observed by a slight magnifying power.

1. Epidermis, composed of parallel lying lamels.

2. Signification of the Rete Malpighii.

3. The textus papillaris with regular arrangement of the papils of the skin.

4. The Corium, consisting of intertwined fibres of the binding texture.

5. The Panniculus adiposus with its round adipose cells.

6. A perspirative gland with an spiral outlet-canal.

7. Another perspirative gland with an outlet-canal of straighter form.

8. Two hair-follicles with their enclosed hair-roots, at the lower end of which the bulb is indicated.

9. A pair of sebaceous glands with their short outlet-canals, discharging into the hair-follicles.

a) Hypertrophy of the skin.
Pityriasis. Ichthyosis.

Pityriasis and Ichthyosis are characterized by exfoliation of the skin, an increased formation of epidermis, which is not connected either with inflammatory symptoms or an interruption of the secretion of the skin. On the contrary it derives from a diffuse hypertrophy of the epidermis with an hypertrophical development of the papillous substance, the matrix of the epidermis. The use of our waters has only a result in the minor degree of this disease, viz in the case of Pityriasis with small white bran-like scales. The best prognosis is to be given, when that malady can be traced back to scrofula or syphilis, so that we may hope to see the symptom vanish with the removal of the constitutional suffering. The case is far more imfavorable in the higher degree of that malady, in the Ichthyosis, where the shedding of large, thick, horny scales takes place. The cause may be that the Ichthyosis is mostly inborn and covers the greatest part of the body, by which the functions of the skin, the regulator of the whole organism, and, therefore, the nutrition and development of the latter are too much injured. In fact nothing can afford a more pitiable spectacle than an individual who presents the picture of a strongly developed Ich-

thyosis, a individual, whose eyes cannot be closed (Ectropium), because the muscles have lost their power and the Cutis its elasticity, and whose ragged skin, covered with fish-scales, as it were, hangs about the emaciated extremities like parchment-trowsers. I have, however, observed even in such desperate cases an amelioration of the constitution by using our waters, an increasing of the muscularity and a diminishing of the exanthemata, though even a stay of several years at Kreuznach failed to effect a complete cure.

b) Inflammations of the skin.

α) Eczema.

The Eczema represents a diffuse Dermatitis united with serous exsudations, which are limited to the superficial layers of the cutis. The exsudation raises the epidermis either in small blisters (Ecz. simplex s. vasculosum), becomes partly muddy and then forms pustules (Ecz. impetiginosum) or desiccates; in the latter case the epidermis comes away in the form of scales and the reddened corium is laid bare (formerly Pityriasis rubra); if it represents a wetted surface the exanthema is called Eczema rubrum (Salt-rheum). The exsudation, thus lying on the surface, may dry up to scurfs and scabs (formerly Tineae). This exanthema seizes almost all parts of the body [Ecz. capillitii (scabs,

if barks are formed) Ecz. faciei, cruris, mammae, scroti, labiorum, perinaei etc]. The causes, to which the Eczema is to be traced, are partly local irritations, partly venous blood-stoppages, particularly at the lower extremities, partly dyscrasical sufferings (Scrofula and Syphilis). The often insupportable itching and the pertinacity, which attend that exanthema, render it one of the most disagreeable maladies.

β. Impetigo.

In cases of impetiginous inflammation of the pappilar substance, the exsudation, secreted on the surface of the Corium, forms already in the beginning small pustules and indurates, when these burst, to yellowish scabs. Local irritations are generally the origin of this malady and scrofulous, as syphilitical persons are the most liable to this kind of exanthema. It is either limited to smaller parts of the body (the hairy part of the head [Tinea muciflua] cheeks, lips, nose [Fraisam, Crusta lactea] shoulder, back, extremities) (J. figurata); or reaches a large extent (J. sparsa). The latter is especially the case, when the exanthema takes a chronical form, in which the parenchyma of the Corium also participates in the process.

γ. Ekthyma.

The Ekthyma-pustules stand isolated, reach the size of a pea to that of a hazel-nut, generally change to cutaneous ulcers and leave then behind them irregular cicatrices. They are seldom to be found in the face, but mostly on the neck, the chest and the extremities. Local irritations and scrofula are commonly the starting point, however we observe this exanthema not seldom with constitutional syphilis. It is to be found then in the hairy parts of the head and in the face; often it is also but a symptom of any other cachexy in badly nourished, decrepit individuals, in whose case the changing and blood-improving action of our brine shows itself prominently.

δ. Pemphigus. Pomphalyx.

Pemphigus depends on superficial Dermatitis, whilst forming isolated blisters. They are to be found on the most different parts of the body, particularly on the trunk from the size of a coffee-bean to that of a hand. The more considerable their extension is, the more numerous the pustules are, the more tendency they show to burst and to leave behind an excoriated skin instead of drying up and the more subsequent outbreaks take place, so much more is the exis-

tence of the whole organism put in danger and our hope of a favorable result of our waters shaken. A scrofulous and syphilitic constitution is the favorite seat of the Pemphigus.

ε. Psoriasis.

The Psoriasis originates always in a chronic Dermatitis with hyperaemy and infiltration of the Corium. Therefore, an anomalous epidermis can only be formed, and, from it and the product of the inflammation, arise the thin, whitish scales. According to the extension and the seat of this malady, we distinguish several formations. This exanthema is not always to be traced to a dyscrasical suffering (syphilis); on the contrary it often attacks individuals in other respects quite healthy. The utmost tenacity of this exanthema, as well as its tendency to return, require the use of our waters not only for a period of many weeks, but also that the cure be repeated several times.

ζ. Lichen. Strophulus.

The exsudation produced by inflammation during the Lichen (Strophulus of children) is deposed in the parenchyma of the Cutis and leads to the formation of conical, mostly clustered, small tubercles of the size

of millet-seeds. They are either confined to small parts of the skin, or occupy a larger extension. This malady does not molest the patient very much, nor does it offer too great hindrances to the action of the brine.

η. Prurigo.

Prurigo arises from a Dermatitis with dispersed, flat, violently itching tubercles. Partly the insupportable pains caused by this exanthema, often robbing the patient of sleep, partly its easy return makes it explicable, that patients feel as if new-born when finding here at Kreuznach a lasting recovery, after having been vainly subjected to the most different procedures at other places.

ϑ. Acne.

The most common seat of the Acne is the face, chest and neck. The Acne vulgaris, which originates in an inflammation and suppuration of obstructed sebaceous glands, is one of those exanthemata, for the cure of which we may give a very favourable prognosis in the use of our waters. That cannot be said of the Acne rosacea (copper-erysipelas), in which the environs of the chronic inflamed sebaceous glands show simultaneously an enlargement of the vessels and a swelling

of the binding texture. It is usually confined to the face and habitual drinkers suffer from it almost exclusively. In order to remove it, we are, therefore, obliged to set to work energetically to reform the organism and to prescribe a lasting change of all habits and a longer, more intensive action of the brine.

i. Mentagra. Sycosis.

The origin of the Sycosis is inflammation and suppuration of the sebaceous glands and hair-follicles of the strong beard-hairs; but the adjoining texture is also drawn into the process, in consequence of which the whole parenchyma of the skin is infiltrated and is to be felt like a thick rind. The seat of this malady is very troublesome, as it can reach such an extent, that the patient is not seldom obliged to shun all human society. There is also scarcely any other exanthema which surpasses it in pertinacity, and, if we think at last, that we have mastered the suffering, we may see new efflorescences appear almost during the night.

c. New formations of the skin.

Lupus.

The first beginnings of Lupus are small reddish maculae (Lupus maculosus) or tubercles (L. tuberculosus) which consist in free granules and cells. Between them

there are embedded disorganised hair-follicles or sebaceous glands. Now, if the epidermis, lying over the central seat of the malady, is loosened and ulcers form, we have that formation of Lupus (exedens), which not seldom occasions great defects of the nose and cheeks. Other parts of the body are very rarely affected by this exanthema. — But, this malady may also end, by resorbing the content of the tubercles, without ulceration and leaving behind hard, sparkling cicatrices (Lupus non exedens). In other cases the Lupus causes considerable exuberances of the binding texture of the hyperaemical Corium (Lupus hypertrophicus). These different manifestations of Lupus are seldom alone, but commonly side by side or one changing into the other.

As this evil develops itself generally only in exceedingly scrofulous individuals, the use of our water will be accompanied with the best success. It will stop the lupous process; normal texture will come in the place of pathological parts of the skin and, when defects want a transplantation, the result of the plastic operation will be secured, because one can plant on a restored ground.

Should it happen, that our waters do not lead quickly to the desired result, we would support it with other means. I think, that I have frequently accelerated the healing process by occassionally pier-

cing the skin-tubercles with a piece of pointed lunar caustic.

d. Parasites of the skin.

α. Favus. Porrigo favosa s. lupinosa.

The favorite seat of the Favus is the hairy part of the head and only very rarely it is to be found in any other part of the body. It arises from the development of a microscopical fungus, which overgrows, in cases of large extension, the whole Capillitium in one uninterrupted surface, out of which the hairs peep like grass-points out of a snow-covering. If the favus efflorescences are less numerous, they form straw-yellow, plate-shaped scurfs, the centre of each separate piece being pierced by an hair. As the Fungus partly penetrates into the commonable outlet-canals of the sebaceous glands and hair-follicles, partly twines round the single hairs, the latter are injured in their growth, are destroyed and must be repaired by new aftergrowth, when the malady has ceased.

Though this malady is very pertinacious and bids defiance to all other remedies prescribed, yet we can remove it almost without any exception by using the brine. It might be difficult to decide, whether the fungus is destroyed by the washing of the head in the bath, strengthened with mother-lye or if the amelioration of the whole constitution by means of

our waters and, therefore, a greater vitality of the skin of the head is the cause of the healing. We think, that both causes act. A careful depilation, made at the same time, will accelerate and secure the result of the cure.

β. Herpes tonsurans.

In Herpes tonsurans the fungus forms in the roots of the hairs and presses itself from there between the fibres of their shafts. The hairs break off close to the skin in small circular spots of the size of a ducat, so that the naked place resembles to a badly shaved tonsure.

Our water proves also an excellent remedy for this disease. The pathologic process is interrupted and the hairs grow anew.

γ. Pityriasis versicolor.

It was formerly believed in consequence of the yellow color of the easily exfoliating maculae, that this exanthema were connected with the maladies of the liver and it received therefore the name of liver-freckle. We are however enlightened on the nature of this malady, since the discovery of Eichstedt has shown, that in the Pityriasis versicolor there are fungi between the lamels of the epidermis. This disease is found particularly on the chest, the neck, the

back and the arms. A small number of baths suffices to rid the patient from this evil.

e) Secretory anomalies of the skin.

α. Hyperidrosis.

Hyperidrosis (excessively augmented perspiration) depends on a weakness of the skin, which often remains after a long illness, which has exhausted the strength of the patient. If the efflux of the sweat is hinderd through constipation of the perspiratory glands, the epidermis rises in small transparent blisters of the size of a pin's head (Miliary blisters. Sudamina).

With a better state of the blood and with the strengthening of the whole organism, which the use of our waters will bring about, this secretory anomaly of the skin disappears gradually.

β. Anidrosis.

The Anidrosis (excessively reduced perspiration) can often last years without any other injury or molestation for the patient, than the relative dryness of the skin, but it forms in some cases a period of transition to more severe skin-sufferings (Psoriasis, Pityriasis and Ichthyosis), if we do not stop the evil. A recovery of the system of the skin to its normal function is certainly to be expected with a long use of our strengthened saline baths.

5) Paralyses.

We can here only occupy ourselves with those cases of paralysis, which originate from a pressure on the nervous fibres by inflammatory exsudation. Such may be the consequence of puerperal maladies and traumatical injuries. We count here also gouty paralyses and that caused by inflammation of the textures of the spinal marrow. In cases of paralysis caused by an effusion of blood into the brain, the use of our waters requires a particular precaution. We may confine the patient in the beginning to the drinking-cure and pass but gradually over to baths. The patient must always cover his head with a cold compress, when in the bath; he is not allowed to remain a long time in it, or to raise the temperature above 88° Fahrenheit. Furthermore belong to the range of Kreuznach all those cases of paralysis, which may be traced back to Hyperaemy and Oedema of the Neuririlemma as well as rheumatical paralyses, and those which are caused by simple catching cold or serious accouchements.

II. Dyscrasies and Cachexies

or

maladies in which especially the brine's accelerating action on the transelementation is to be considered — an action that removes the substance injurious to the body, the Materia peccans — and in wich the recovery is secured in consequence of the amelioration of the blood.

The bad blood-mixture either owes its origin to a morbid matter coming from outward [chronic metal-maladies (mercury, lead, arsenic)] or is formed by exorbitantly accumulated normal (Polypiosis, Plethora) or consumed constituents of the blood (Arthritis, Rheumatism, Lithiais).

1) Mercurial dyscrasy and Constitutional syphilis.

Mercurialism is formed in persons, to whom mercury was ordered as medicament, chiefly against syphilis, or in workmen, who are exposed to the inhaling of mercurial vapours in consequence of their occupations. The latter cases are seldom, but, on the contrary, the former generally concern individuals, who have suffered from syphilis and by whom mercury has been misused. We have then not alone to deal with Hydrargyrosis, but simultaneously with secondary syphilitic symptoms of the most different shapes, which have localized themselves either on the skin as exan-

themata, or on the mucous membrane of the mouth, the nose, the throat, the pharynx, the larynx, the rectum and the genitals as ulcers, or in the bones and the periosteum (Gummata, Tophi, Exostoses, Caries and Nekrosis), or in the iris and chorioidea as inflammation, or finally in the binding texture of the muscles and in the inner organs as so-called syphilitic infiltration.

The mission of our waters is here to cause a better state of the blood in order to raise the abated condition of strength and to accelerate the transelementation in order to remove the influence pernicious to the body. We leave it undecided, how much of the action of the brine is to be attributed to the Jodine and the cognate Bromine, both the best antidotes against mercury we know. If we think, that brine will not lead us to the desired result we have recourse to the decoction of Zittmann for eight to fourteen days, and we carefully divide the time of the patient's stay in such a manner, that the use of this medicament, highly promoting and strongly stirring up all secretions and excretions, comes in the midst of the whole period of the cure. During that epoch the patient keeps his room, suspends the drinking of the waters, but daily takes a bath. After the bath he goes to bed and drinks his warmed bottle, intended for the morning-hours. When the perspiration is over, he may spend the rest of the day out of bed. This treatment is the more to

be approved, as experience tells us, that we have not to expect so favorable a result, if the decoction of Zittmann or any similar mixture (Syr. of Laffecteur, Syr. of Boiveau, Dct. Pollini, Dct. of Vigarou) is taken alone and not simultaneously with the use of our waters. I have sufficiently convinced myself of it, when certain conditions did forbid a simultaneous drinking- and bathing-cure and I was obliged to order those decoctions alone. The considerable contingent, which this evil sends every year to our waters, proves that my colleagues abroad must have made the same experience.

But not alone cases, in which mercurialism is united with secondary syphilis, seek and find help in Kreuznach, but also those of purely secondary-syphilitic formations. The latter are to be found in twofold shapes. Firstly in patients who have been several times primarily infected and who have been often subjected to a mercurial treatment. If then secondary symptoms do at last break out, under these conditions they have a certain tenacity. It is true, that the symptoms of the secondary syphilis anew disappear, when mercury is given, but recidivation takes place very easily and that at the moment where we think, we are masters of the enemy. Our waters put an end to this very inclination to such relapses.

Secondly, every one, at whose disposal there

is a richly syphilitic material, will have made the observation, that there are individuals, in whom the primary affections may be suppressed with mercury but not the secondary. That is particularly the case with syphilitic ulcers and tumours of the tongue and syphilitic maladies of the skin and bones. The complication of the syphilis with scrofula is also to be reckoned here. Though we do not exactly stand helpless in such cases, we have nevertheless in the use of our waters a way which leads us surest to our aim. In these cases of syphilis I attach also a great importance to the Jodine and Bromine contained in our spring. — The happy effects of our brine in all forms of malady before us have induced the habit of sending individuals to Kreuznach, who are recovering from syphilis (primary and secondary) or even when considered as quite cured, to guard them from future events. Other patients, who continually torment their physician, because they fear being in danger of secondary eruptions, arrive also here to their own and their physicians tranquillity.

2) Polypiosis.

The Polypiosis arises from a too abundant accumulation of fat in the blood. Besides the general obesity, spread over the whole body, which is charac-

terized by a considerable stratum of fat under the skin and enormous accumulation of fat in the omentum and mesentery, we have to consider also the fat-liver and infiltrations of the milt. Besides the inheritable disposition, the over-indulgence in pleasures of the table is cause of the Polypiosis as soon as the equilibrium between the amount of nourishment taken into the body and the amount of matters thrown out of the body is disturbed. It is easily understood that during the whole treatment, besides the taking of the waters, diet plays the principal part. Here, if any where, it must be a low diet. Animal food is at the most only to be allowed in small quantities. Sleep must be limited to a few hours and the greatest part of the day is to be devoted to distant excursions. It is astonishing to observe, what a considerable diminution of the weight of the body takes place, when these prescriptions are punctually performed. At the same time all the symptoms of this troublesome suffering disappear: the short-breath, lethargy, faintings and the inclination to abundant perspiration. Not seldom we have also occasion to observe a reduction of the volume of the enlargened liver and milt. The hitherto obstructed change of composition of the blood-corpuscles in their parenchyma is restored in consequence of the use of the brine and more and more these organs return to their normal function.

3) Plethora.

Plethora depends on an excessivly increased amount of Albumen in the blood and an augmentation of the blood-corpuscles (Andral and Gavaret). This mixture of the blood originates in too abundant import of substantial food and a non-consumption of the nourishment in consequence of a sedentary life. The mission of the therapeutics is therefore to remove the disproportion, which has been developed between the amount of matters taken into the body and the actually consumed ones, and, removing the matters accumulated in the body, to guard against a new accumulation by an improved sanguification. The highly animated transelementation by the use of our waters and its sanitary influence on the the blood causes this aim to be attained in the highest degree. We have mentioned (see page 60) that according to Vogel and C. Schmidt Chloride of Sodium and Albumen are contained in the Serum sanguinis in an inverse proportion and, without any doubt, we owe the favorable action of our brine on the Plethora partly to this proportion of mixture, in consequence of which the amount of Albumen in the blood diminishes by means of the introduction of common salt. Certainly also is the sanitary influence of our waters on the inertness of the intestinal canal, by

which hyperaemies of the abdominal organs are removed, and further the powerfully animated peripheric circulation, consequent on the brine-bath, which causes a diminution of blood in the vessels of the abdomen, both of a high importance in respect to the removal of the abdominal stoppage (stasis).

A rigidly precise diet may go hand in hand with the action of the brine. It may be by preference a vegetable one. Spirituous liquors and even coffee and tea are to be avoided as retarding the transelementation. A scrupulous observance of these prescriptions of the medical attendant will then lead to the best results.— The congestions of the brain and faintings diminish, the bluish redness of the cheeks disappears and even the suspicious red nose returns to its natural colour. The weariness and heaviness in the limbs vanishes, the tardy stool becomes regular, anguish and depression make way for a merry disposition of mind and the patient remains spared from maladies, which Plethora causes to develop (gout, haemorrhoids, swelling of the liver, diseases of the heart, apoplexy etc.). If at all, in this malady, a grape-cure*) is to be recommended after the use of our waters for several weeks.

*) In our pleasant, sunny valley, favoured with a mild climate, vines of very superior quality are cultivated. Kreuznach consequently enjoys a great and well deserved renown as a place for grape-cure and the number of visitors is increasing every year.

If we are able to remove the Plethora itself and prevent its consequences by using the brine, we may certainly expect, that our waters will prove useful also in most cases, where we have to remove a suffering developed out of it. We consider in the following paragraphs some of these diseases and particularly those, in which experience tells us, that they may be treated with success at Kreuznach.

4) Arthritis.

The nature of the gout consists in an immoderate quantity of uric acid being mixed with the blood. Animal food causes an increase of uric acid. Gout will therefore appear most where the conditions for the accumulation of this substance are present, consequently in persons who are slaves to the pleasures of the table and who do not take sufficient exercise. Here not only is the body supplied with too much nourishment, with more than its maintenance demands, but the organism also misses exercise, which is a necessity for a good health. The deposition of uric acid in the joints [mostly in the ball-joint of the great toe (Podagra) more seldom in other joints (Gonagra, Ischiagra, Chiragra, Omagra)] provokes the periodical fits of gout under the form of specific inflammation of the joints. After its expiration, the remaining local appearances

(tophi and contractions and anchyloses, caused by exsudations) are not only to be removed, but we must also put an end to the disposition to gout, if we wish to prevent further gouty fits. — We possess in the brine an excellent remedy of satisfying the first demands, which can be made on a medicament for gout, that is acceleration of the transelementation and consequent removal of the surplus of uric acid. That effect may be aided by bodily exercise. We therefore recommend to the patient for every day long pedestrian tours in our beautiful environs, or if he is deprived of the use of his limbs at least passive exercise for several hours (going in a carriage or in a boat) or mixed ones (riding or rowing).

We will not neglect on this spot to draw the attention to the high importance of the Lithium which our waters contain (according to Loewig there are contained in 16 ounces of the Eliza's spring 0,613 grains of Chloride of Lithium and according to Polstorf in 10,000 grains of mother-lye 10,3 grains of Chloride of Lithium. Bunsen even found 145,3 grains in them). Kreuznach certainly owes a great part of the effect, which we observe in gouty patients after the use of our waters, to its property of dissolving the uric acid.

The second requirement in the cure of gout is to cause a diminished supply. We must, therefore, especially regulate the diet, which must be

frugal, even under certain circumstances scanty. An exception is only allowed, when the suffering is already gout-cachexy, in which case it would be necessary to have recourse to a strengthening diet.—Here we see anew the action of the brine in two directions, since it not only removes the morbid depositions and therefore restores the motion, but it also obviates the first cause of the gout, the abnormal nutrition, by regulating the digestion and consequently preventing the relapses.

5) Rheumatismus.

Rheumatism seems also capable of being traced to an urate-diathesis. At least the great quantities of urates which are secreted with the urine in rheumatic patients seem to indicate that. It may be that in rheumatism uric acid is not to be found in the blood in such a high degree as in gout (Garrod, C. G. Lehmann); nevertheless I think I am justified in classing rheumatism under this head, as in cases of gout and rheumatism, both pass one into another in such a manner, that it is impossible to draw fixed limits. — The forms of rheumatism, which are cured at Kreuznach are very various. We see persons who have suffered from acute joint-rheumatism using our waters for some weeks in order to prevent any relapse, though

there are no remaining traces of the disease perceptible. But not in such cases alone have our waters proved useful, they have done so also with patients whose limbs were contracted and anchylosed on account of thickening of the joint-capsule and lingaments and effusion into the cotyla remaining after an acute articular rheumatism. The question is here not only to raise and to improve the whole constitution, but also to remove the local malady. These patients also do not leave us unsatisfied; on the contrary I have often seen an anchylotic knee, where the upper and lower part of the leg formed an acute angle, return to perfect flexibility after two monthly use of the brine. If we have denied, as above (see page 83) mentioned, that the cure of anchylosis of a higher degree, resulting from other inflammations, is to be made with the use of the brine alone, we are the more fortified in our opinion in consequence of the results of our waters in rheumatic anchylosis, that inflammations, attended with rheumatism, are of a specific nature; here the exsudation caused is at all events more accessible to dissolution. — The springs of Kreuznach do not only enjoy a notable power against the sufferings consequent on acute rheumatism but also against the sundry manifestations of chronical rheumatism of the skin, the muscles, the joints and rheumatical neuralgia.

6) Lithiasis.

The greatest part of the stony concretions in the urinary apparatus (kidney, ureter and bladder) consists of uric acid and urates and only a few of phosphates and oxalate of lime. This fact allows the deduction that the formation of calculi depends mostly on a dyscrasy caused by urates. The experience, that Lithiasis, like gout, is caused by a too luxurious manner of living where corresponding corporal exercise is wanting confirms also this opinion. — According to the results of our waters in respect of gout, we may conclude that the brine is only suited for those concretions which do not contain phosphates and oxalates. To treat the patient, suffering from stone, with success we must therefore begin with a scrupulous chemical analysis of the urinary sediments. The dissolution of a stone already formed cannot be accomplished here or indeed at any other bathing-place. But we can hinder the formation of a larger stone by the use of our spring and remove the cause of the malady by causing a greater export of uric acid, when the disease of stone is limited to a secretion of urinary sand and gravel.

Besides, smaller concretions will be washed away mechanically in consequence of the increased diuresis. Convulsive contractions, caused by its passage through

the ureter, are removed by the warmth of the bath. Relying upon these experiences we find that Kreuznach is not seldom chosen also for patients who have endured a lithotomy or lithotrity in order to deliver them from their disposition to lithiasis and to prevent further formations of stone.

Chapter IV.

The Atmosphere of the Salt-works.

A) Their physical Properties and chemical Composition.

The air surrounding our earth consists of a mixture of 21 parts of oxygen and 79 parts of nitrogen. We find this reciprocal proportion unaltered at the equator as well as at the poles, on the highest mountains as well as in the depths, at all seasons and at every hour of the day. To those two essential components we have to add small quantities of ammoniac gas, watery vapour and carbonic acid which are never wanting in our atmosphere, but exist there in a changeable proportion.

It is just that changeableness and the simultaneous existence of other agents favourably mixed with the atmosphere of the graduation-works, to which we owe the happy combination of the component parts of the saline-atmosphere and its sanative power.

In this atmosphere different relations than those

out of it must certainly prevail; how could we otherwise explain the peculiar smell, reminding us of sea-weed, in the neighbourhood of the graduation-works? How else could we account for the pleasing and refreshing feelings, which take possession of us, as soon as we enter that sphere and which force us involuntarily to breathe deeper?

Not unjustly has the air about the graduation-works been compared with that of the sea-coast. And indeed the composition of both atmospheres has a great resemblance (compare: Verhaeghe. Traité pratique des bains de mer). To explain the nature of the saline-atmosphere in an analytical way is difficult, because our reagents are not sensitive enough and therefore generally give a negative result. — However the examination of the following facts will make the prevailing circumstances clear:

1.) In consequence of the evaporation of the brine which takes constantly place about the graduation-works, warmth is given off. The air is therefore colder, denser and more compact than the warmer, thinner and lighter air out of this region. A volume of air in the neighbourhood of the graduation-works contains therefore a larger quantity of oxygen than a similar quantity at a distance from them; we consequently inhale here a larger quantity of oxygen than elsewhere.

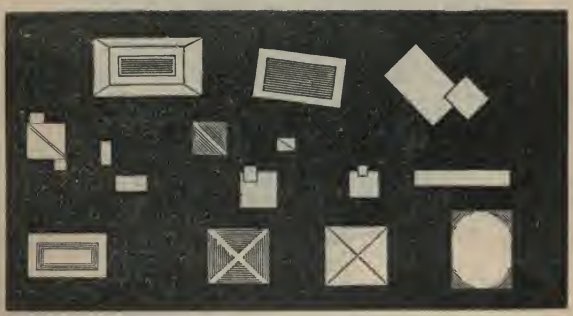
2.) The atmosphere about the graduation-works is in consequence of the continual process of evaporation of the brine saturated with watery vapour in a tolerably high degree. The higher the temperature the more watery vapour it will absorb. Particularly in the heat of summer the maximum will set in at noon in consequence of the higher warming power of the sun. On the other hand the degree of humidity will be still increased, when west and south-west winds blow simultaneously, as these winds, coming from the Atlantic Ocean and passing over France, are already warm and moist.

3.) The amount of carbonic acid contained in the air about the graduation-works is diminished; it can even sink to a minimum, because the rain, artificially produced by the dropping of the brine, absorbs the carbonic acid continually. We observe the same phenomenon in great expanses of water, f. e. on large lakes, an experience which is easily verified by the following experiment. If we expose a cup, filled with lime-water (a saturated dissolution of slaked lime in water) to the influence of the atmospheric air, we shall see after some time a white cuticle (cremor calcis) floating on the surface and increasing gradually in proportion as the lime-water absorbs carbonic acid and as the latter becomes united with the lime to carbonate of lime. In my own observations about the graduation-

works I had to wait for some minutes, before I could discover any traces of this formation, whilst at a distance from the works, it began in the first moment so that the whole surface of the cup was covered within two days. At the graduation-works it required four days to produce the same quantity of carbonate of lime.

4.) Whilst the brine drops down through the high thorn-walls, it does not only evaporate but it is also reduced to dust by its falling on the brushs and is carried away by the wind. The atmosphere about the graduation-works is therefore saturated with the component parts of the brine among which chloride of sodium

Fig 7.



naturally predominates. This fact is easily proved by the aid of the microscope, that is, if we take the atmospheric precipitate near to the graduation-works on a sheet of glass. We then see crystals of chloride of sodium, which have formed after the

evaporation of the water, affording a most delightful picture under the microscope, though they do not indeed lie so close together and do not reach the size or present the richness of shadowing, that they do, when a drop of brine has been evaporated upon a glass-sheet. The fig. 7 above shows a collection of crystals, as they will form out of a drop of brine.*)

Fig. 8.

Fig. 8 gives a representation of a larger quantity of crystals out of a drop of evaporated brine, as they can be seen, lying side by side, with one view. To obtain the same appearance from the meteoric

*) A 315-fold linear magnifying power has been used in all these observations.

precipitate, we should be obliged to expose the glass-sheet for several days to the action of the atmosphere about the graduation-works.

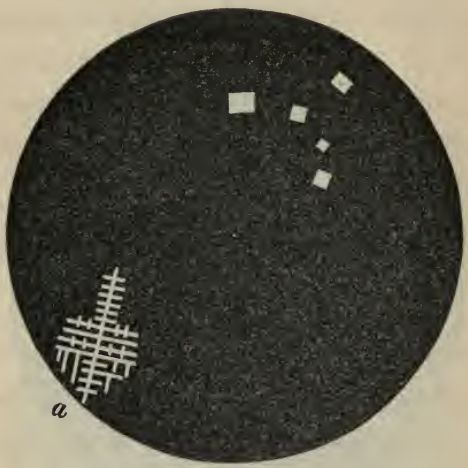
Fig. 9.

Fig. 9 is a microscopic representation of a glass-sheet, which has lain for 24 hours at a distance of 15 paces from the thorn-wall.

Fig. 10. proves that chloride of sodium is to be found not only in the atmosphere of the neighbourhood of the graduation-works, but also for a great distance round. The glass-sheet under consideration had been laid out for 24 hours at a distance of 100 paces from the thorn-wall of the graduation-buildings. The cry-

stal-cluster *(a)* in fig. 10 represents crystals of sal-amoniac, which have been formed by the combina-

Fig. 10.



tion of the evaporated chlorine with the ammonium of the atmospheric air.

The content of common salt in the atmosphere of the salt-works can rise during the hot season, when the evaporation takes place quickly and a calm does not prevail, to such a degree that we taste it easily on our lips. In consequence of the reducing of the brine to dust in its passage through the graduation-works a considerable quantity of common salt is lost. The daily loss at our salt-works is estimated at 2147 pounds, of which 1573 pounds are to be reckoned to

the salt-works of Karls- and Theodorshalle and the remaining 574 pounds for those of Münster a/St.

5.) The concentration of the brine, since it takes place with the graduation, must naturally increase its content of Jodine and Bromine and to this addition, passing with the chloride of sodium into the atmosphere, we owe perhaps partly that pleasant feeling which steals upon us, when breathing the air of the salt-works.

B. The Action of the Saline-atmosphere.

It is impossible to imagine, that such a complex in respect to quality and quantity, as it is to be found in the atmosphere of the graduation-works, should be without any influence upon the organism. The skin and the lungs are the parts of our body, which first come in contact with the atmosphere, and through them the exchange between the components of the air and our blood takes place. They form therefore also the mediators which bring in play the different agents of the saline-atmosphere.

In the air of the graduation-works, which is denser and therefore richer in oxygen, the process of the respiration will go on with more intensity. The breathing becomes deeper and fuller. The air penetrates into the utmost and finest bronchia; the quantity of oxygen, which in breathing is given to the

capillaries of the lung in order to oxydate the blood, is greater and it is very evident that the energy of all the apparatus and processes, which aid in the formation of blood and nutrition of the body, must increase. We can now understand why the sojourn at the graduation-works causes a more intensive strength of the nerves and muscles. Hand in hand with the increased reception of oxygen the expulsion of carbonic acid will go on. As these processes of exchange and combustion are the chief source of the inner warmth of our body, the latter will increase by inhaling the saline-atmosphere. Therefore the warmth which the organism loses, while living in the fresher atmosphere of the graduation-works, will be restored and protect the body from catching cold.

The richness of watery vapour in the saline-atmosphere will also operate favorably on the organism; for the more moist the inhaled air is, the less the blood loses water by breathing, the less the lungs dry up, the less water does the skin evaporate and the less warmth of our body is spent.

The amount of chloride of sodium contained in the atmosphere of the graduation-works is also of great importance. We owe to this circumstance its sanative influence on the respiratory organs, as expectoration is induced and facilitated, the difficulty in breathing removed and the cough moderated.

C) The Indications of the Saline-atmosphere.

Such happy relations will certainly favor the use of the saline-atmosphere for purposes of healing. Among the sufferings which will find relief and recovery here, those will stand in the first rank, in which it is desired to bring about a higher blood-renovation by means of an increased reception of oxygen, therefore, a larger consumption of the organic matters, in short a restoration of the sunk vital power. Hence it follows that the sojourn at the graduation-works will be beneficial to feeble and delicate persons, to those with a languid and lymphatic constitution, with anaemic, chlorotic conditions, to Rhachitis or Scrofula and to individuals reduced and exhausted by a long illness (typhus, diarrhoea, loss of blood) during their convalescence.

The atmosphere at the graduation-works is furthermore inhaled with a happy result in consequence of its greater humidity and its content of common salt, which act calming and dissolving in chronic catarrhs and blennorrhoea of the respiratory organs, in asthma, in emphysema of the lungs and in the beginning of pulmonary consumption.

As the fresh and tonic atmosphere at the graduation-works is in itself of high importance for the amelioration of the blood, it will be evident, what a precious aid to the drinking- and bathing-cure the

sojourn in the neighbourhood of the salt-works must be. We recommend therefore to all patients, who cannot make distant excursions, to spend every hour they can spare there.

D. Appendix.

Some other Methods of inhaling saline Ingredients.

The observations above will sufficiently show, that the inhaling at the graduation-works, independently of the salutary exercise and the animating and refreshing coolness of the atmosphere, cannot be compensated by any other method of inhaling the saline ingredients.

In former times it was customary to send patients into the seething-houses, when graduated brine was boiling, in order to make them inhale the vapours, rising out of the seething-pans, as it was assumed, that those vapours contained saline ingredients. The whole process of crystallization requires ten days, of which two are destined to boil the graduated brine with a strong firing and the remainder to evaporate it by a gentler heat.

But since Mr. Polstorf, apothecary at Kreuznach, has proved, as is shown in the following analysis, that during the boiling of the brine only the atmosphere two feet above the seething-pans contains small quantities of salt-particles (in a cubic foot of vapour with 149° Fahrenheit 0,0072 grams of salt and on the second day 0,017 grams) and the remaining days not a

trace, is the sojourn in the boiling-houses for therapeutic purposes farther illusory. If we add, that the

	Boiling-days.	Temperature of the vapours, according to Fahrenheit.	Specific gravity of the condensed vapours.	Amount of the salts free from water in the condensed vapours per cent.	Amount of water in one cubic foot of vapour in grams.	Amount of the salts in one cubic foot of vapour in grams.
during the boiling.	1	149°	1,0021	0,253	2,856	0,0072
	2	154°	1,0045	0,566	3,005	0,0170
during the evaporation	3	104°	1,0005	0,078	0,895	0,0007
	5	99°	1,0002	0,035	0,832	0,0003
	7	95°	1,0000	0,026	0,761	0,0002
	9	91°	1,0000	0,027	0,740	0,0002

inhaling would be only useful during the first two days, but that the temperature near the boiling-pans is then so high (149° to 154° Fahrenheit) that the patient is forced to take involuntarily a steam-bath with the inhaling, that he must leave the seething-house dripping with sweat and that he is therefore exposed to catching the worst cold, it will be easily understood, why this method has been abandoned.

The assertion that the vapours, arising from the water of the bath, contain a so great quantity of the brine's components as to be able to develop an effect, when taken up by the lungs, must likewise

fall to the ground, as the analysis shows, that only 0,0002 grams of salt were to be found in one cubic foot of vapour with 95° Fahrenheit.

Another method of inhaling saline ingredients, namely the evaporation of the brine or mother-lye by means of an alcohol-lamp in the patient's room, has also been closely examined by the analysis. If the liquid is not brought to and kept at the boiling-point, no effect whatever is produced; and those who have made this experiment know, how unpleasant it is to inhale such an atmosphere in consequence of the decomposition of some components of the brine.

The air of the drinking-room at Münster a/St., where the brine evaporates and is reduced to dust by means of a fitting apparatus, resembles the saline-atmosphere the most in respect to its nature and action. However the inhaling at the graduation-works is always to be prefered as is shown by the facts given above (see page 132 et cetera). The proportion of the saline-atmosphere to that of the said expedient is the same as the warmth of the sun in the open air to that of a fireside.

Notwithstanding the sojourn in that drinking-room may always serve as a substitute, when cold and rainy days prevent the inhalation of the real saline-atmosphere.

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